

VMS Upgrade and Installation Supplement: VAX 6000 Series

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This document supplements the current version of the *VMS Upgrade and Installation Manual* with information specific to VAX 6000 series computers. This information includes startup, shutdown, and backup procedures.

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Preface

The *VMS Upgrade and Installation Supplement: VAX 6000 Series* contains installation and upgrade information specific to VAX 6000 series computers. Use it in conjunction with the *VMS Upgrade and Installation Manual*.

Important: When you are ready to upgrade, install, or update the VMS operating system, use the supplied documentation as follows:

- 1 Read all release-specific cover letters (if any) included with your distribution kit.
- 2 Read the most current version of the *VMS Release Notes*.
- 3 Consult the *VMS Upgrade and Installation Manual* for the VMS version that you are installing or upgrading to. It is your primary source for step-by-step upgrade and installation procedures.
- 4 Refer to this supplement for computer-specific information when the *VMS Upgrade and Installation Manual* directs you to do so.
- 5 Store this supplement and the *VMS Upgrade and Installation Manual* in the binder that contains the *VMS Release Notes*.

The VAX 6000 series computers are multiuser systems that are fully compatible with other VAX computer software, including VMS software, optional software, and applications software, and can be used as symmetric multiprocessors. The number of processors in a VAX 6000 series computer is indicated by the model number. For example, the VAX 6000-410 has one processor, the VAX 6000-420 has two processors, and so on.

Intended Audience

VMS Upgrade and Installation Supplement: VAX 6000 Series is intended for anyone responsible for installing or upgrading the VMS operating system on a VAX 6000 series computer.

Document Structure

This manual is organized as follows:

- Chapter 1 describes the parts of the console subsystem that you use during a VMS upgrade or installation, including the TK50 and TK70 tape cartridge drives.
- Chapter 2 describes how to use a compact disc drive.
- Chapter 3 describes some of the tasks you need to perform when you install the VMS operating system from either a tape or compact disc drive.

Preface

- Chapter 4 contains instructions for starting up the system. It also describes system shutdown procedures.
- Chapter 5 describes backup procedures you should perform on a regular basis.
- Appendix A describes how the system assigns controller letters.
- Appendix B describes how to write a new boot block on the system disk.
- The Glossary defines key terms used in this manual.

Associated Documents

You should have the following documents:

- The *VMS Upgrade and Installation Manual*, which is your primary source of upgrade and installation information. Use the *VMS Upgrade and Installation Manual* in conjunction with the *VMS Upgrade and Installation Supplement: VAX 6000 Series* when you are performing an installation or an upgrade.
- The *VMS Release Notes*, which provides important information on various aspects of the VMS operating system. You should read the current version of the *VMS Release Notes* before installing, upgrading, or updating the VMS operating system or using your VAX computer.
- The hardware manuals that are supplied with your VAX computer. These manuals provide detailed information about your system hardware.
- If applicable, the hardware manuals and booklets supplied with your RRD40 compact disc drive, InfoServer system, and VMS distribution compact disc (CD).

Conventions

The following conventions are used in this manual:

Ctrl/x	A sequence such as Ctrl/x indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.
red ink	Red ink indicates information that you must enter from the keyboard or a screen object that you must choose or click on. For online versions of the book, user input is shown in bold .
boldface text	Boldface text represents the introduction of a new term or the name of an argument, an attribute, or a reason. Boldface text is also used to show user input in online versions of the book.

UPPERCASE TEXT

Uppercase letters indicate that you must enter a command (for example, enter OPEN/READ), or they indicate the name of a routine, the name of a file, the name of a file protection code, or the abbreviation for a system privilege.

numbers

Unless otherwise noted, all numbers in the text are assumed to be decimal. Nondecimal radixes—binary, octal, or hexadecimal—are explicitly indicated.

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A vertical ellipsis indicates the omission of items from a code example or command format; the items are omitted because they are not important to the topic being discussed.

1. The first part of the paper is devoted to a discussion of the various ways in which the concept of "truth" has been used in philosophy. It is shown that the concept has been used in a variety of different ways, and that these different uses have led to a great deal of confusion and disagreement among philosophers. The author argues that this confusion can be avoided if we recognize that the concept of "truth" is not a single, unified concept, but rather a collection of different concepts, each of which has its own meaning and use.

2. The second part of the paper is devoted to a discussion of the various ways in which the concept of "truth" has been used in science. It is shown that the concept has been used in a variety of different ways, and that these different uses have led to a great deal of confusion and disagreement among scientists. The author argues that this confusion can be avoided if we recognize that the concept of "truth" is not a single, unified concept, but rather a collection of different concepts, each of which has its own meaning and use.

3. The third part of the paper is devoted to a discussion of the various ways in which the concept of "truth" has been used in religion. It is shown that the concept has been used in a variety of different ways, and that these different uses have led to a great deal of confusion and disagreement among religious people. The author argues that this confusion can be avoided if we recognize that the concept of "truth" is not a single, unified concept, but rather a collection of different concepts, each of which has its own meaning and use.

Introduction

Summary

1

Console Subsystem

Before you install or upgrade the VMS operating system, you need to be familiar with the console subsystem of your VAX 6000 series computer. The console subsystem consists of the following:

- Console terminal
- Control panel
- Tape cartridge drive
- Console command language

In general, use the console subsystem to examine and deposit data in memory or in registers, stop the system, and boot the operating system. During installations, use the console subsystem to boot the system and to monitor the installation process.

This chapter describes each component of the console subsystem. If your system configuration includes a remote compact disc (CD) drive, see Chapter 2.

1.1 Console Terminal

The console terminal is a video or hardcopy terminal attached to the system. It displays a log of system activities. Use the console terminal to control and monitor system operations. You can also keep a record of an installation or upgrade either by using a hardcopy console terminal or by attaching a printer to the console video terminal (if it has that capability).

1.2 Control Panel

The control panel is located on the front of the cabinet, in the upper left corner. It consists of the following:

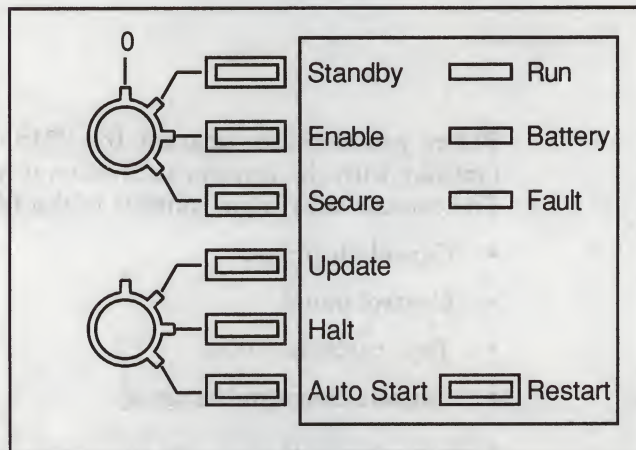
- An upper, 4-position key switch
- A lower, 3-position key switch
- Six lights that correspond to the settings of the key switches
- A Restart button
- Three status indicator lights

Figure 1-1 shows how the switches and lights on VAX 6000 series computers are labeled.

Console Subsystem

1.2 Control Panel

Figure 1-1 Control Panel



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1.2.1 Key Switches

The control panel of a VAX 6000 series computer has the following two key switches:

- An upper key switch with four positions. Use it to turn the power on and off.
- A lower key switch with three positions. Use it to access the console terminal and to disable or enable automatic restart after a power failure.

To change the setting of a key switch, insert the key and turn it to the desired setting. After you select a switch setting, the corresponding light to the right of the switch glows. There is no light for the Off (0) position.

Table 1-1 lists the settings for the upper key switches and Table 1-2 lists the settings for the lower key switches.

Table 1-1 Upper Key Switch Settings

Position	Effect	Light Color
Off	Shuts off all power except to the battery backup.	No light
Standby	Supplies power only to the power supply, blower, and memory. Used for system maintenance.	Red
Enable	Supplies power to the whole system. You can use the console terminal in console mode, or use the Restart button.	Yellow
Secure	Supplies power to the whole system. Used for normal system operation. You cannot use the Restart button or the console terminal in console mode.	Green

Table 1-2 Lower Key Switch Settings

Position	Effect	Light Color
Update	Displays the console prompt at the console terminal. Used to modify the Electrically Erasable Programmable Read-Only Memory (EEPROM).	Red
Halt	Causes the system to halt rather than restart following a power failure or error halt.	Yellow
Auto Start	Allows the system to reboot automatically after a power failure or error halt.	Green

1.2.2 Restart Button

Depending on the position of the key switches, pressing the Restart button boots the system, runs self-tests, or does both. Table 1-3 describes various key switch settings and the corresponding function of the Restart button.

Note: The upper key switch must be in the Enable position for the Restart button to function.

Table 1-3 Restart Button Functions

Upper Key Switch	Lower Key Switch	Function
Enable	Auto Start	Runs self-tests. If the system passes the self-test, it reboots.

(continued on next page)

Console Subsystem

1.2 Control Panel

Table 1-3 (Cont.) Restart Button Functions

Upper Key Switch	Lower Key Switch	Function
Enable	Update or Halt	Runs self-tests, halts, and displays the console prompt (>>>).
Standby or Secure	Any position	None.

1.2.3 Status Indicator Lights

There are three status indicator lights on the control panel: Run, Battery, and Fault. Table 1-4 describes the functions of these lights.

Table 1-4 Status Indicator Lights

Light	Color	State	Meaning
Run	Green	On	System is executing operating system instructions.
		Off	System is in console mode or turned off.
Battery	Green	On	Battery backup unit is fully charged.
		Flashing once per second	Battery backup unit is charging.
		Flashing 10 times per second	Battery backup unit is supplying power to the system.
		Off	System either does not have a battery backup unit or is turned off.
Fault	Red	On	Self-test in progress. If this light remains on, there is a hardware fault (see your computer-specific owner's manual).
		Off	Self-test is finished or the system is turned off.

1.3 TK50 and TK70 Tape Cartridge Drives

This section briefly describes the TK50 and TK70 tape cartridge drives. See the hardware information for your system for a complete description of the tape cartridge drive.

The tape cartridge drive is located in the upper left corner on the front of the cabinet.

Note: In general, tape cartridges cannot be exchanged between TK70 and TK50 tape drives. However, the TK50 tape cartridge can be read on (but not written to) a TK70 drive.

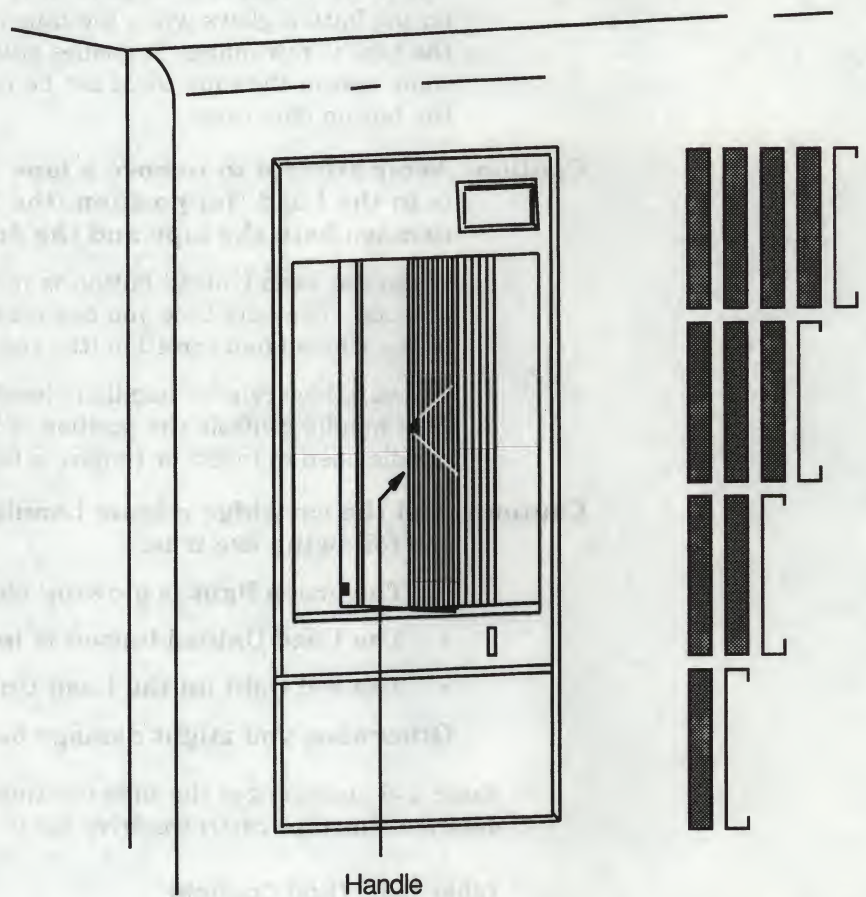
Console Subsystem

1.3 TK50 and TK70 Tape Cartridge Drives

1.3.1 TK50 Tape Cartridge Drive

Figure 1-2 shows a TK50 tape cartridge drive.

Figure 1-2 TK50 Tape Cartridge Drive



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When using the TK50 tape cartridge drive, you should be aware of the following:

- The green light flashes when the tape in the drive is actually moving (being read from or written to). If a tape cartridge is in the drive and this light is off, the drive is inactive and the tape is not positioned at its beginning.

The green light glows when the drive is empty. It also glows when the drive is inactive and positioned at the beginning of a tape. The only time you can remove a tape cartridge is when the green light is glowing steadily.

Console Subsystem

1.3 TK50 and TK70 Tape Cartridge Drives

Caution: *Never attempt to remove a tape when the green light is flashing or when it is off; you might damage both the tape and the drive.*

- The red Load/Unload button controls the loading of the tape.

When the button is pressed in, it is in the Load position. The red light on the button glows when the tape is loaded. It flashes *slowly* when the tape is rewinding. It flashes *quickly* when there is a tape error (for some reason the tape could not be read). To clear a tape error, press the button four times.

Caution: *Never attempt to remove a tape when the Load/Unload button is in the Load (in) position (the red light is on); you might damage both the tape and the drive.*

When the Load/Unload button is released, it is in the Unload (out) position. The only time you can remove a tape is when this button is in the Unload (out) position (the red light is off).

- The cartridge release handle is located next to the tape access slot. This handle controls the position of the tape drive spindle. Pull the handle open to insert or remove a tape cartridge.

Caution: *Pull the cartridge release handle open **only** when all three of the following are true:*

- The green light is glowing steadily.
- The Load/Unload button is in the Unload (out) position.
- The red light on the Load/Unload button is off.

Otherwise, you might damage both the tape and the drive.

Table 1-5 summarizes the tape cartridge drive controls. Table 1-6 describes the tape cartridge drive lights.

Table 1-5 TK50 Controls

Control	Position	Function
Load/Unload button	In	Loads the tape (15 seconds to 3 1/2 minutes).
	Out	Rewinds and unloads the tape.
Cartridge release handle	Open	Lets you insert or remove a tape after rewind and unload operations are complete.
	Closed	Locks tape in operating position.

Console Subsystem

1.3 TK50 and TK70 Tape Cartridge Drives

Table 1-6 TK50 Indicator Lights

Red Light	Green Light	Condition
Off	Off	No power to the tape drive.
Off	On	Safe to move cartridge release handle. Power is turned on.
On	Off	Do not move the cartridge release handle. One of the following conditions exists: <ul style="list-style-type: none"> • Power-on self-test is occurring. • Cartridge is inserted but handle is still in the up position. • Tape is loading or unloading. • Tape is stopped.
On	On	Tape loaded successfully.
On	Flashing	Tape is moving (except rewind). Read/write commands are being processed. Irregular, rapid flashing means tape calibration is occurring.
Flashing	Flashing	Tape is rewinding.
Rapid flashing	Off	A fault is occurring. Press and release the Load/Unload button four times. If the problem persists, do not attempt to remove the tape cartridge. Call Digital Customer Services.

1.3.2 TK70 Tape Cartridge Drive

Figure 1-3 shows a TK70 tape cartridge drive.

Note: TK70 tape drives can read all TK50 tape cartridges; they cannot write to TK50 tape cartridges.

When using the TK70 tape drive shown in Figure 1-3, you should be aware of the following:

- The orange light glows when the tape cartridge is write-protected.
- The yellow light glows when the tape is loaded.
- The green light glows when the tape is unloaded.

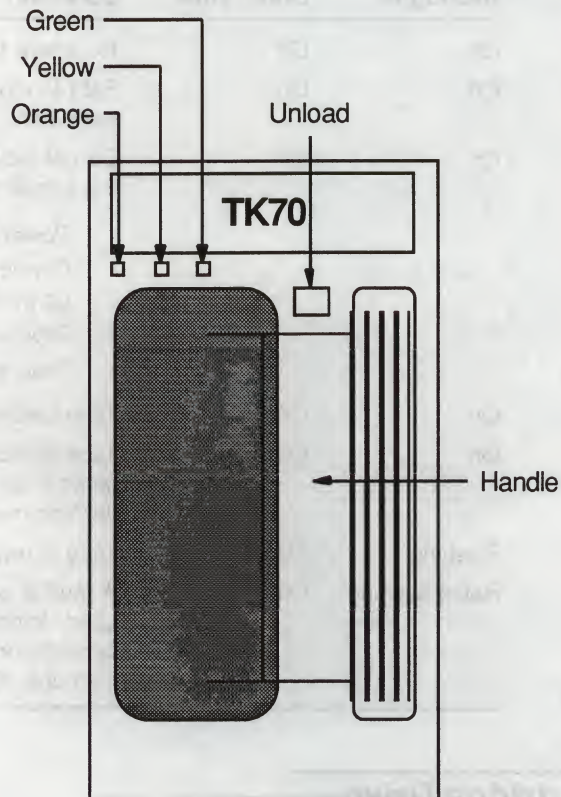
Caution: Never remove a tape when the green light is off or when the orange or yellow light (or both) is on; you might damage both the tape and the drive.

- You use the Unload button to rewind and unload the tape.
- The cartridge release handle is located next to the tape access slot. This handle controls the position of the tape drive spindle. Pull the handle open to insert or remove a tape cartridge.

Console Subsystem

1.3 TK50 and TK70 Tape Cartridge Drives

Figure 1-3 TK70 Tape Cartridge Drive



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Caution: Pull the cartridge release handle open only when the green light glows steadily and the yellow light is off. Otherwise you might damage both the tape and the drive.

Table 1-7 summarizes the TK70 tape drive controls. Table 1-8 describes the indicator lights.

Console Subsystem

1.3 TK50 and TK70 Tape Cartridge Drives

Table 1-7 TK70 Controls

Control	Position	Function
Unload button	Pressed in	Rewinds and loads the tape (15 seconds to 3 1/2 minutes).
Cartridge release handle	Open	Lets you insert or remove a tape after rewind and unload operations are completed.
	Closed	Locks tape in operating position.

Table 1-8 TK70 Indicator Lights

Orange	Yellow	Green	Condition
Off	Off	Off	No power to the tape drive.
On briefly	On briefly	On briefly	Power to the tape drive.
Off	Flashes	Off	The tape is moving or the tape drive is initializing the tape.
Off	Off	On	Drive beeps. Safe to move the handle and insert or remove a tape.
Off	On	Off	Tape loaded successfully.
Off	Off	Flashes	The cartridge leader may be defective. Pull open the handle and remove the cartridge from the drive. Do not use the cartridge.
Flashes	Flashes	Flashes	A fault is occurring. Press the Unload button. The orange, yellow, and green lights glow briefly and the drive reinitializes. If the problem persists, do not attempt to remove the tape cartridge. Call Digital Customer Services.

1.4 Console Command Language

The console subsystem runs in two modes: program mode and console mode.

- **Program mode** — In program mode, the VMS operating system controls the console subsystem. The Run light on the control panel glows. In program mode, you can enter DCL commands, run programs, and receive system messages.
- **Console mode** — In console mode, the VMS operating system is not running and the system is halted. (You can halt the system yourself by pressing Ctrl/P). The console terminal displays the console prompt (>>>) and the Run light on the control panel is off. If the upper

Console Subsystem

1.4 Console Command Language

key switch is not set to Secure, you can control and monitor system operations by entering console commands.

Table 1-9 describes the console commands used in this supplement.

Table 1-9 Commonly Used Console Commands

Command	Definition
BOOT	Starts the process that loads system software into memory. Use the abbreviation B for the BOOT command.
DEPOSIT	Puts a value in the specified register or memory location.
EXAMINE	Displays the contents of the specified register or memory location.
SET BOOT	Equates a boot command to a nickname.
SHOW CONFIGURATION	Displays hardware and self-test information about the system.

For more information on the console subsystem and command language, see the hardware manuals supplied with your VAX computer.

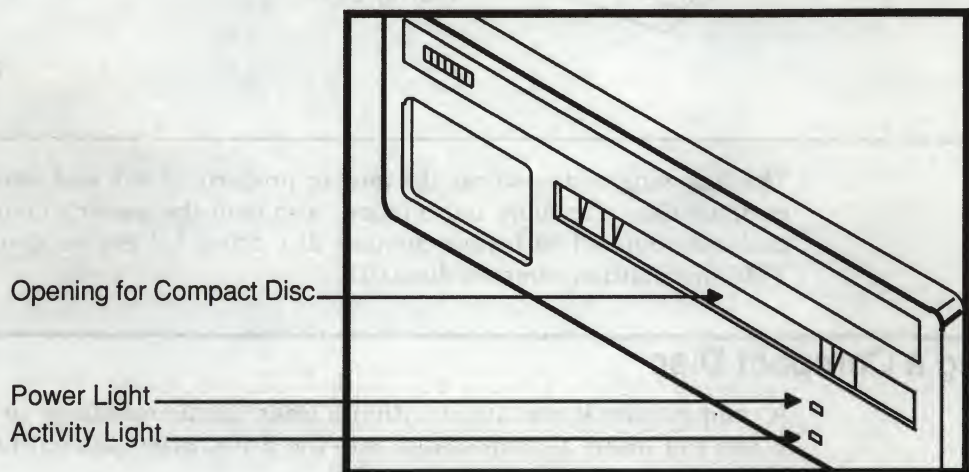
2

Using a Compact Disc Drive

This chapter describes how to use a compact disc drive. In this case, the configuration is a **remote compact disc drive**, which consists of an RRD40 compact disc drive attached to an InfoServer (a general-purpose disk storage server connected to the Ethernet). Review all relevant cover letters and the *VMS Release Notes* to make sure your VAX 6000 series system has this capability.

The RRD40 compact disc (CD) drive is a read-only drive that reads data stored on removable compact discs. Using a remote compact disc drive (for example, an RRD40 connected to an InfoServer), you can install and boot the VMS operating system across the Ethernet from a compact disc. Figure 2-1 shows an RRD40 compact disc drive in an expansion box, which can be connected externally to an InfoServer unit.

Figure 2-1 RRD40 Compact Disc Drive in Expansion Box

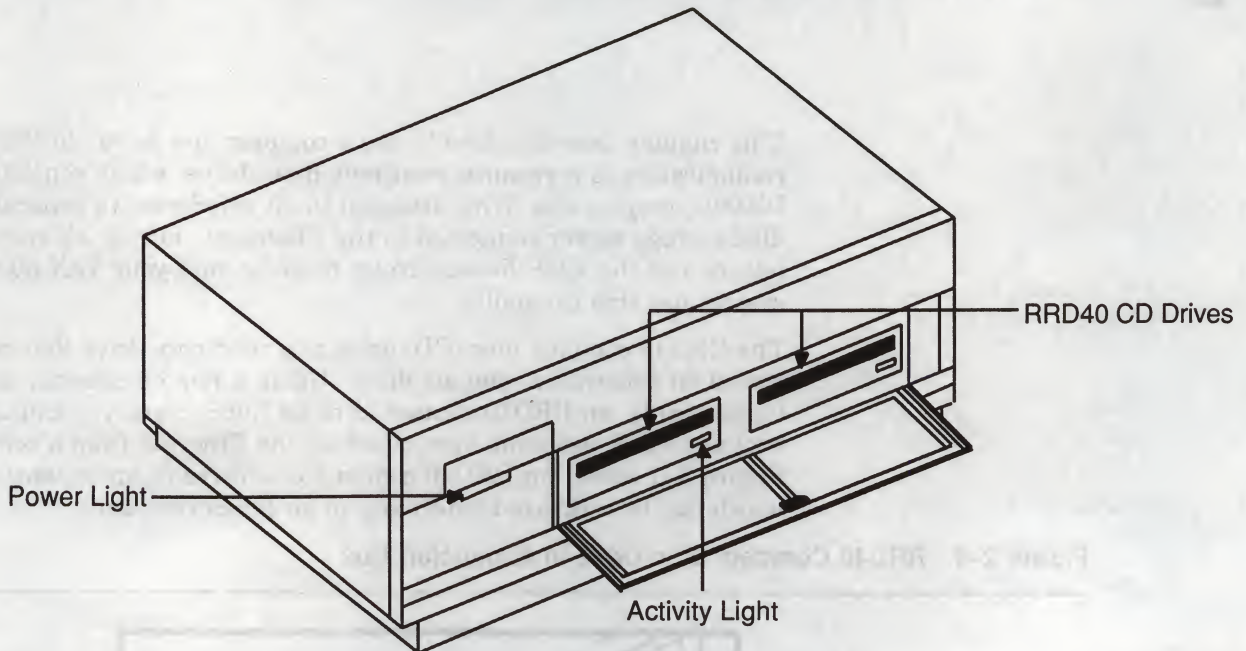


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Figure 2-2 shows two RRD40 compact disc drives connected internally to an InfoServer unit.

Using a Compact Disc Drive

Figure 2-2 InfoServer with Internal RRD40 Compact Disc Drives



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The following sections describe how to properly insert and remove a compact disc. For more information, also read the owner's manuals and booklets supplied with your compact disc drive, InfoServer system, and VMS distribution compact disc (CD).

2.1 Inserting a Compact Disc

A compact disc is contained within a clear plastic container, or **caddy**. When you insert a compact disc into the drive, insert the entire caddy. **DO NOT** remove the disc from the caddy.

To insert a compact disc into the drive, do the following:

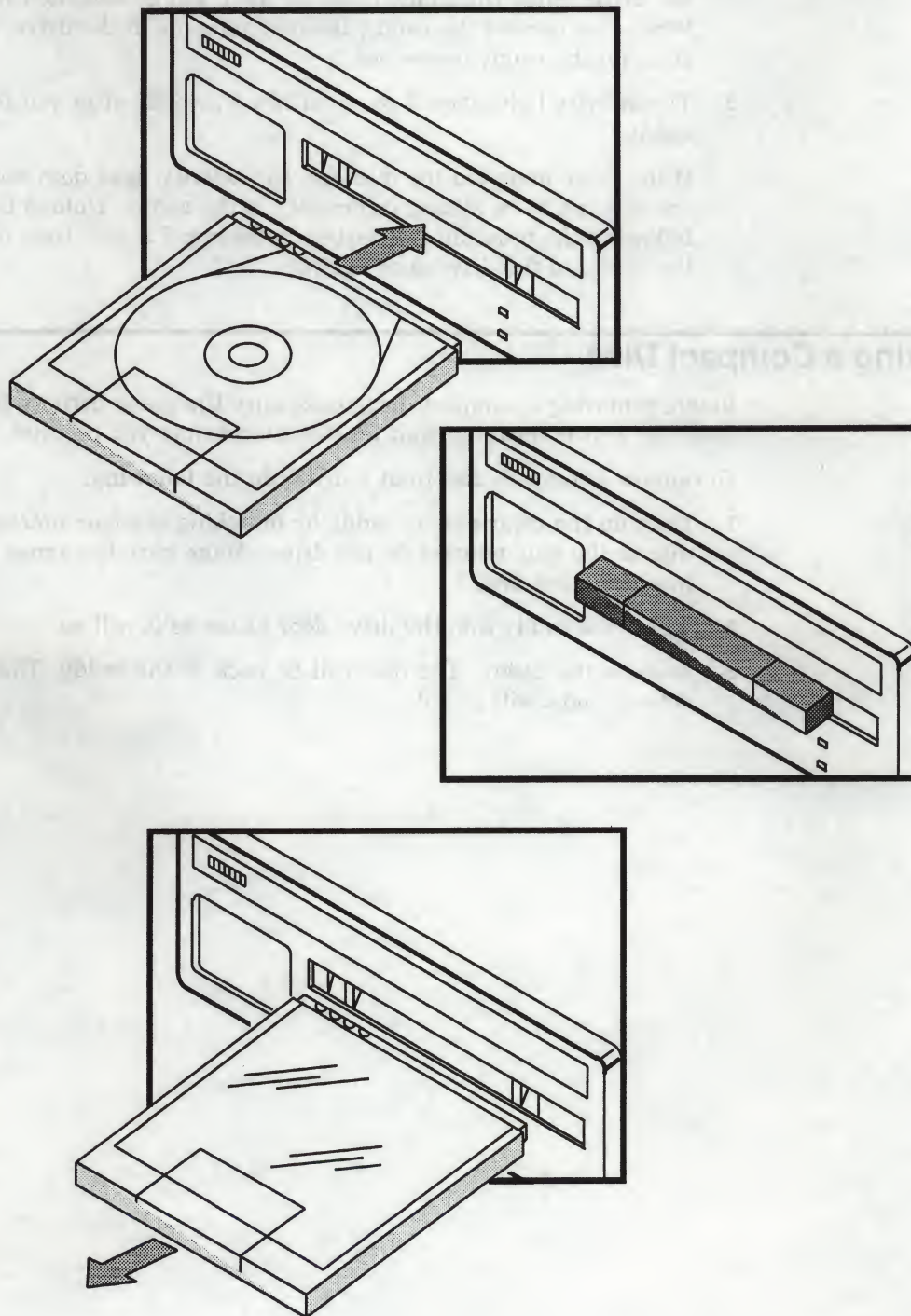
- 1 Make sure the power to the drive is on (the power light on the drive should be lit).
- 2 Examine the caddy. Make sure it is not cracked or damaged in any way.
- 3 Examine the disc inside the caddy. One side of the disc is labeled. The label should always be facing up as you insert the disc into the drive.

When the label is facing up, the four notches on the caddy are on the left, as shown in Figure 2-3. These notches line up with four similar notches on the front of the drive.

Using a Compact Disc Drive

2.1 Inserting a Compact Disc

Figure 2-3 Inserting and Removing a Compact Disc



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Using a Compact Disc Drive

2.1 Inserting a Compact Disc

- 4 Insert the caddy as shown in Figure 2-3. Make sure the notches on the left side of the disc caddy line up with the notches on the door of the drive. Slide the caddy in as far as it will go and then remove it. When you remove the caddy, the disc remains in the drive. Only the clear plastic caddy comes out.
- 5 The activity light should go on within 5 seconds after you remove the caddy.

If the drive accepted the disc and the activity light does not go on, the disc might be sitting incorrectly in the caddy. Unload the disc, by following the procedure described in Section 2.2, and then try inserting the disc into the drive once again.

2.2 Removing a Compact Disc

Before removing a compact disc, make sure the green activity light is not flashing. If it is flashing, wait for it to stop before you proceed.

To remove a compact disc from a drive, do the following:

- 1 Position the clear plastic caddy by matching the four notches on the disc to the four notches on the drive. Make sure the arrow is going into the drive first.
- 2 Insert the caddy into the drive door as far as it will go.
- 3 Remove the caddy. The disc will be back in the caddy. The green activity light will go out.

3

Installing the VMS Operating System

The *VMS Upgrade and Installation Manual* is your primary source for step-by-step upgrade and installation procedures. Start any VMS installation or upgrade by following the instructions in the *VMS Upgrade and Installation Manual*.

Refer to this chapter for installation information that is specific to VAX 6000 series computers. These procedures include the following:

- Turning on the system (Section 3.1)
- Determining device names (Section 3.2.1)
- Booting during an installation (Section 3.2.2)
- Booting standalone BACKUP (Section 3.3)
- Booting the new system disk (Section 3.4)

Note: The screen displays and examples in this manual depict the installation of VMS Version 5.4. Your screen displays reflect the version that you are installing.

If you are installing the VMS operating system on a VAX computer that is part of a VAXcluster environment, read the *VMS VAXcluster Manual*.

3.1 Turning On the System

The following steps describe how to turn the system on and how to set the switches on the control panel:

- 1 Turn on the console terminal.
- 2 If your system has a CIBCA-A, insert the console tape cartridge into the console drive.
- 3 At the control panel, set the lower key switch to Halt (see Figure 1-1).
- 4 Set the upper key switch to Enable.

The system initializes and self-tests. During the test, the red Fault light glows. The system then displays a self-test message and the console prompt (>>>). See the following sample display.

Installing the VMS Operating System

3.1 Turning On the System

```
F  E  D  C  B  A  9  8  7  6  5  4  3  2  1  0  NODE #
  A  A  .  .  .  M  M  M  M  .  P  P  P  P  TYP
  O  O  .  .  .  +  +  +  +  .  +  +  +  STF
  .  .  .  .  .  .  .  .  .  E  E  E  B  BPD
  .  .  .  .  .  .  .  .  .  +  +  +  +  ETF
  .  .  .  .  .  .  .  .  .  E  E  E  B  BPD

.  .  .  .  .  .  .  .  .  .  .  .  .  XBI D -
.  .  .  .  .  .  .  .  +  .  +  .  +  XBI E +

.  .  .  .  .  .  A4 A3 A2 A1 . . . . ILV
.  .  .  .  .  .  32 32 32 32 . . . . 128 Mb

ROM0 = 1.00 ROM1 = 1.00 EEPROM = 1.00/1.00 SN = NIO128
>>>
```

Note: If your console displays garbled characters instead of the self-test message, the baud rates of the console terminal and the computer do not match. Set the baud rate on the console terminal to 1200.

- 5 Return to the *VMS Upgrade and Installation Manual* to continue the installation.

3.2 Before Installing VMS

The following sections describe operations you must be familiar with before you install the VMS operating system. These include determining device names (Section 3.2.1) and booting during an installation (Section 3.2.2).

3.2.1 Determining Device Names

At different times during the installation, you need to tell the system which drive holds the distribution media and which drive holds the system disk. Refer to a drive by its *device name*. A device name has the following format:

ddcu

where:

- *dd* is the *device code*. The device code tells what type of device you are using.
- *c* is the *controller designation*. The controller provides the interface between the processor and the drive. A controller designation—which can be one of the alphabetic letters, A through Z—combines with the unit number to identify the location of the device. For information about how the system assigns controller letters, see Appendix A.
- *u* is the *unit number*. A unit number can be a decimal number in the range of 0 to n .¹ The unit number, along with the controller designation, identifies the location of the device.

¹ The first drive on a controller is usually assigned a unit number of 0, the next drive is assigned a unit number of 1, and so on. The range is determined by the bus that supports the device. For example, KDB50 disks can have unit numbers in the range of 0 to 254.

Installing the VMS Operating System

3.2 Before Installing VMS

Note: The only part of the name you can readily modify is the unit number. The device code is fixed and the controller designation is made when the hardware is installed.

For example, MUC6 might be the device name for the tape cartridge drive on your system. *MU* is the device code for the tape cartridge drive. *C* names the controller and 6 is the unit number.

If a drive is connected to a hierarchical storage controller (HSC) device, precede the device name with the name of the HSC and a dollar sign (\$). For example:

TROUT\$DUA0

TROUT is the name of the HSC device, and DUA0 is the name of an RA82 drive that is connected to it.

Table 3-1 lists device codes for the different drives that can be part of a VAX 6000 series system.

Table 3-1 Device Codes for VAX 6000 Series Systems

Device	Device Name	Boot Name
Console tape cartridge drive	MU	CSA1
RA60 disk drive	DJ	DU
RA70, RA80, RA81, and RA82 disk drives	DU	DU
TA78, TA79, TA81/TA81-PLUS and TU81/TU81-PLUS magnetic tape drives	MU	—
InfoServer compact disc drives (for systems with that capability)	DAD ¹	ET or EX ²

¹The controller letter for all InfoServer compact disc drives is fixed at *D*.

²Refer to your computer-specific owner's guide to determine whether *ET* or *EX* is the boot name used by your system.

Any of the disk drives—except InfoServer compact disc drives—can hold the system disk. When you choose a system disk, be aware of the disk's capacity, as well as the size of the VMS operating system. Keep in mind that a system disk in a VAXcluster environment needs more space for the operating system than does a system disk for a standalone system.

Before you begin the installation procedure, be sure you know the device names for the drive that will hold the distribution media and the drive that will hold the system disk.

Installing the VMS Operating System

3.2 Before Installing VMS

3.2.2 Booting During an Installation

During the installation, you need to boot the system disk several times. This section explains how to determine boot names for devices connected to a VAX 6000 series computer.

The VAX 6000 series computers boot using small programs stored in read-only memory (ROM). These programs are known as **boot primitives**. Because the boot process is slightly different for each type of drive, a boot primitive exists for each drive the system supports.

To boot the system using a boot primitive, you must specify the **boot name** of the device from which you want to boot. Boot names have the following format:

`ddu`

where:

- `dd` is the device code
- `u` is the unit number

Table 3-1 lists the boot names for the different devices that can be part of a VAX 6000 series system.

Note that CSA1 is an exception to the standard device name format. The location of the tape cartridge drive is programmed into ROM and given the name CSA1. You can always use this name to boot from the tape cartridge drive, unless you change its location on the system.

Suppose you are planning to boot a local disk that has the boot name DU3. You would use the following procedure:

- 1 To see how your system is configured, enter the following command and press Return:

```
>>> SHOW CONFIGURATION
```

The system displays information about the nodes present on the XMI and VAXBI buses, as follows:

	Type	Code	Rev
1+	KA62A	(8001)	0001
2+	KA62A	(8001)	0001
3+	KA62A	(8001)	0001
4+	KA62A	(8001)	0001
6+	MS62A	(4001)	0001
E+	DWMB A/A	(2001)	0001
XBI	E		
1+	DWMB A/B	(0107)	FFF0
4+	KDB50	(010E)	0F1C
5+	DRB32	(0101)	0001
6+	TBK50	(410E)	0001

(Appendix A provides more information about how the system assigns letters to controllers connected to the XMI and VAXBI buses.)

Installing the VMS Operating System

3.2 Before Installing VMS

- 2 Find the disk controller (KDB50) in the second part of the display. Then look in the first column of that line for the VAXBI node number. Write down this number. In this example, the VAXBI node number is 4.
- 3 Write down the XMI node number of the DWMBA/A. This number appears in the first column of the first section in the display. In this example, the XMI node number is E.
- 4 Enter the following command and press Return:

```
>>> BOOT/XMI:E/BI:4 DU3
```

If you want to boot from an HSC disk, you need to add the /NODE qualifier to the BOOT command. Use the /NODE qualifier to specify the HSC node number (in hexadecimal) of the HSC device you want to use when you boot the system.

Also, if you have a CIBCA-A adapter and are booting over the CI (computer interconnect), you need the console tape cartridge. For example, an HSC system disk might have the following configuration:

- A unit number of 1.
- A VAXBI node number of 4 (the CI adapter is connected to the VAXBI at node 4).
- An XMI node number of E (the VAXBI that the disk is on is connected to the XMI at node E).
- An HSC node number 02.

In this case, you would boot the system by first inserting the console tape cartridge into the console drive. Then, you would enter the following command and press Return:

```
>>> BOOT/XMI:E/BI:4/NODE:02 DU1
```

Note: If the system does not boot, a hardware or software problem might exist. Refer to Section 4.1.9 for symptoms of hardware and software problems and the actions you can take to correct them.

For more information about the BOOT command and its qualifiers, see Chapter 4. For more information about the hardware configuration of your system, see the hardware manuals provided with your system.

- 5 Return to the *VMS Upgrade and Installation Manual* to continue the installation.

3.3 Booting Standalone BACKUP

This section describes the steps for booting standalone BACKUP. Standalone BACKUP lets you transfer the VMS *required* save set from the distribution media (tape cartridge or compact disc) to your system disk. The distribution media are labeled similar to the following:

Installing the VMS Operating System

3.3 Booting Standalone BACKUP

Distribution Tape Cartridges	
Printed Label ¹	Volume Label ²
VMS BIN TK50 1/2 BINARY	VMS054
VMS BIN TK50 2/2 S/A BKUP & DECWINDOWS	DECW54
VMS MANDATORY UPDATE	VMSMUP

Distribution Compact Disc	
VMS Version 5.4 Compact Disc	VMS054

¹The label affixed to the tape cartridge or compact disc.

²The name the VMS operating system uses when referring to the original distribution media (either tape cartridge or compact disc).

3.3.1 Booting Standalone BACKUP from a Tape Cartridge

To boot standalone BACKUP from a tape cartridge, perform the following steps:

- 1 If your system contains a CIBCA-B, insert the tape cartridge that contains standalone BACKUP into the console drive. If your system contains a CIBCA-A, make sure the console tape cartridge is in the console drive.
- 2 Enter the following command and press Return:

```
>>> B CSA1
```

- 3 The procedure displays a self-test message similar to the following:

```
F  E  D  C  B  A  9  8  7  6  5  4  3  2  1  0  NODE #
A  A  .  .  .  M  M  M  M  .  P  P  P  P  TYP
O  O  .  .  .  +  +  +  +  .  +  +  +  STF
.  .  .  .  .  .  .  .  .  E  E  E  B  BPD
.  .  .  .  .  .  .  .  .  +  +  +  +  ETF
.  .  .  .  .  .  .  .  .  E  E  E  B  BPD
.  .  .  .  .  .  .  .  .  .  .  .  XBI D -
.  .  .  .  .  .  .  .  .  +  .  .  +  XBI E +
.  .  .  .  .  A4 A3 A2 A1  .  .  .  .  ILV
.  .  .  .  .  32 32 32 32  .  .  .  .  128 Mb
```

```
ROM0 = 1.00 ROM1 = 1.00 EEPROM = 1.00/1.00 SN = NIO128
```

```
Loading system software.
```

```
.
```

- 4 If your system contains a CIBCA-B, skip this step.

If your system contains a CIBCA-A, the procedure displays the following message:

```
Please remove the volume "CONSOL" from the console device.
```

```
Insert the first standalone system volume and enter "YES" when ready:
```

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3.3 Booting Standalone BACKUP

Remove the console tape cartridge. Insert the tape cartridge that contains standalone BACKUP into the console tape cartridge drive. When the distribution tape cartridge is loaded, enter Y (for YES) and press Return.

Standalone BACKUP displays a message similar to the following:

```
Resuming load operation on volume 'DECW54', please stand by...
```

- 5 The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

- 6 The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

```
Configuring devices . . .
```

```
Available device MINE$DUA0:          device type RA81
```

```
Available device MINE$DJA3:          device type RA60
```

```
.
```

```
.
```

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

- 7 When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Stand-alone BACKUP V5.4; the date is 19-JUN-1990 15:30
```

```
$
```

- 8 Remove the tape cartridge that contains standalone BACKUP.
- 9 To create the system disk using the BACKUP command, return to the *VMS Upgrade and Installation Manual*.

3.3.2 Booting Standalone BACKUP from a Remote Compact Disc

Note: The following procedure applies *only* to VAX 6000 series computers capable of booting from a remote compact disc drive, such as an Ethernet-based InfoServer system equipped with RRD40 compact disc drives. To make sure your VAX 6000 series system has this capability, review all relevant cover letters and the *VMS Release Notes*. You should also read Chapter 2 in this supplement and the owner's manuals or booklets supplied with your InfoServer system, RRD40 compact disc drive, and VMS distribution compact disc.

To boot standalone BACKUP from a remote compact disc, use the following procedure:

- 1 Place the VMS distribution compact disc in the remote compact disc drive (in this case, an RRD40 compact disc drive connected to an Ethernet-based InfoServer system). If your system contains a CIBCA-A, make sure the console tape cartridge is in the console drive.

Installing the VMS Operating System

3.3 Booting Standalone BACKUP

- 2 Make sure your system is physically connected to the *same* Ethernet cable as the InfoServer.

- 3 Enter the following command and press Return:

```
>>> SHOW ETHERNET
```

In this example, the system displays information about the Ethernet controllers present on the XMI and VAXBI buses, using the following format:

```
XMI:x BI:y nn-nn-nn-nn-nn
```

where:

- *x* is the XMI node value.
- *y* is the BI node value.
- *nn-nn-nn-nn-nn* is the hexadecimal representation of the Ethernet controller's unique address. Keeping a list of each Ethernet address and corresponding processor (CPU) with that address can help you find which systems are generating specific messages.

- 4 To boot standalone BACKUP on a VAX 6000 series system from across the Ethernet, enter the following command, specifying the XMI and BI values displayed previously by the SHOW ETHERNET command. Then, press Return. For example:

```
>>> BOOT/XMI:D/BI:6/R5:100 ET0
```

Note in the previous example of booting standalone BACKUP that ET0 represents the Ethernet port to the boot device. However, if your system requires EX as the boot device name instead (see Table 3-1), boot standalone BACKUP by entering the following command:

```
>>> BOOT/XMI:D/R5:100 EX0
```

- 5 The procedure displays a self-test message similar to the following:

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	NODE #
A	A	.	.	.	.	M	M	M	M	.	P	P	P	P	.	TYP
.	.	.	.	.	.	+	+	+	+	.	+	+	+	+	.	STF
.	.	.	.	.	.	.	.	.	.	.	E	E	E	B	.	BPD
.	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	ETF
.	.	.	.	.	.	.	.	.	.	.	E	E	E	B	.	BPD
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	XBI D -
.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	XBI E +
.	.	.	.	.	.	A4	A3	A2	A1	.	.	.	.	.	.	ILV
.	.	.	.	.	.	32	32	32	32	.	.	.	.	.	.	128 Mb

```
ROM0 = 2.00 ROM1 = 2.00 EEPROM = 1.00/1.00 SN = NIO128
```

```
Loading system software.
```

(Note that ROM version numbers will be different for VAX 6000 series systems with upgraded console ROMs.)

- 6 After the system displays its self-test message, it prompts you for a file name, as follows:

```
Filename:
```

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3.3 Booting Standalone BACKUP

- 7 In response to the prompt, enter the following and press Return:

Filename: **ISL_LVAX**

Several informational console messages are displayed.

- 8 The system then displays the following:

Ethernet Initial System Load Function

Function ID	Function
1	- Display Menu
2	- Help
3	- Choose Service
4	- Stop

Enter a function ID value:

This display indicates that the Initial System Load (ISL) image is loaded, which means you can now locate the InfoServer services present on your Ethernet. Note that the term **service**, in this context, refers to any drive and media combination that is connected to an InfoServer system. In this example, the service is the RRD40 compact disc drive (connected internally or externally to the InfoServer, as described in Chapter 2) containing the VMS Version 5.4 Compact Disc.

- 9 Continue the procedure by entering 3 (for Function ID item number 3, Choose Service) and then pressing Return:

Enter a function ID value: **3**

The next display is as follows:

Service options:

- 1 = Find Service
- 2 = Enter Known Service Name
- =>

- 10 Enter 1 and then press Return. The message "Working" indicates that the ISL image is searching for all InfoServer services present on the Ethernet.

Service options:

- 1 = Find Service
- 2 = Enter Known Service Name
- => **1**

Working

- 11 After the ISL image completes its search, the system displays the list of known service names. For example:

Servers found:: 1

Service Names Format:

Service Name
Server Name
Ethernet ID

#1
VMS052
DIS_08002b150589
08-00-2b-15-05-89

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3.3 Booting Standalone BACKUP

```
#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number =>
```

- 12** To boot standalone BACKUP from the VMS Version 5.4 distribution compact disc, enter 2 and then press Return:

```
Servers found:: 1
```

```
.
```

```
#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number => 2
```

- 13** The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

- 14** The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

```
Configuring devices . . .
```

```
Available device DAD1:           device type RRD40
Available device $DUA0:          device type RA81
Available device MINE$DJA3:      device type RA60
```

```
.
```

```
Enter "YES" when all needed devices are available:
```

Note that DAD1: is the device name of the InfoServer service you are booting from, in this case an RRD40 compact disc (connected to the InfoServer) containing the VMS Version 5.4 distribution compact disc. If that device or other devices fail to appear in the list, make sure that all the drives are properly connected to the system before you enter YES at the prompt. See your hardware manuals for details.

- 15** When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Stand-alone BACKUP V5.4; the date is 19-JUN-1990 15:30
$
```

- 16** To create the system disk using the BACKUP command, return to the *VMS Upgrade and Installation Manual*.

3.4 Booting the New System Disk

When you enter the BACKUP command to start an installation, as described in the *VMS Upgrade and Installation Manual*, the *required* save set from the distribution tape cartridge or compact disc is transferred to your system disk. You know the *required* save set is on the new system disk when you see the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

This message indicates that the *required* save set has been transferred from the distribution media to the system disk and that the files are being checked for errors. Several minutes later the procedure displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990 16:00
If you do not want to perform another standalone BACKUP operation,
use the console to halt the system.
```

If you do want to perform another standalone BACKUP operation, ensure the standalone application volume is online and ready. Enter "YES" to continue:

To continue the installation, boot the new system disk as follows:

- 1 Press Ctrl/P to put the system in console mode.
- 2 If your system has a CIBCA-A adapter and you are booting the system disk over the CI, remove the tape cartridge labeled VAX/VMS V5.4 VMS TK50 and insert the console tape cartridge.
- 3 To boot the new system disk, enter the BOOT command in the following format:

```
>>> BOOT /XMI:a /BI:b [/NODE:c] DUu
```

where:

- *a* is the XMI node number of the node being accessed
- *b* is the VAXBI node number of the node being accessed
- *c* is the HSC node number (in hexadecimal) of the node being accessed
- *u* is the unit number of the system disk

For example, if your system disk has a unit number of 1, on VAXBI node number 4, and XMI node number D, enter the following command and press Return:

```
>>> BOOT /XMI:D /BI:4 DU1
```

Booting the system takes several minutes.

- 4 When the boot is complete, the procedure displays some messages and asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return.

Installing the VMS Operating System

3.4 Booting the New System Disk

Note: If the system does not boot, a hardware or software problem might exist. Refer to Section 4.1.9 for symptoms of hardware and software problems and the actions you can take to correct them.

- 5 Once you have successfully booted the new system disk, return to the *VMS Upgrade and Installation Manual* to continue the installation.

4 System Startup and Shutdown

During a VMS installation or upgrade, your system will shut down and reboot several times. Although the installation and upgrade procedures usually can perform these tasks automatically, you might need to manually shut down or reboot your system. Also, you will occasionally need to reboot the system during normal operation. This chapter describes different ways of booting and shutting down the system.

4.1 Booting the System

Booting is the process of loading system software into memory. The VAX 6000 series computers boot using small programs, called **boot primitives**, stored in ROM (read-only memory). Because the boot process is slightly different for each type of device, a boot primitive exists in ROM for each device the system supports. A boot primitive does the following:

- Sets up the system environment.
- Deposits values in registers.
- Tells the system what type of drive the system disk is on, as well as the controller designation and unit number of the drive. The /XMI, /BI, and /NODE qualifiers to the BOOT command give the system additional information about where the system disk is located.
- Loads the VMS operating system.

The boot process consists of the following steps:

- 1 You enter the BOOT command and any applicable qualifiers. The specified boot primitive deposits information in the general-purpose registers.
- 2 VMB.EXE, the primary boot program, is loaded from the boot block on the system disk (block 0) or from the console tape cartridge into memory. VMB.EXE is a program that allows access to the system disk. VMB.EXE locates SYS\$SYSTEM:SYSBOOT.EXE on the system disk and loads it into memory.
- 3 SYSBOOT.EXE loads the SYSGEN parameters stored in SYS\$SYSTEM:VAXVMSSYS.PAR and checks the conversational boot flag. If the flag is set, the procedure stops and displays the SYSBOOT> prompt. If the flag is not set, SYSBOOT.EXE loads the VMS executive into memory and transfers control to the VMS executive.
- 4 When the VMS executive finishes, it executes the SWAPPER process.
- 5 The SWAPPER creates the SYSINIT process.
- 6 SYSINIT creates the STARTUP process.

System Startup and Shutdown

4.1 Booting the System

- 7 STARTUP executes SYS\$SYSTEM:STARTUP.COM (unless you indicated another file at the SYSBOOT> prompt) and SYSTARTUP_V5.COM. The current values of SYSGEN parameters are written back to VAXVMSSYS.PAR.
- 8 The boot process finishes. You can then log in to the VMS operating system.

By setting certain System Generation Utility (SYSGEN) parameters, you can control how many CPUs are activated at boot time and the character of the multiprocessing system. In a multiprocessing system, the primary CPU is always booted. By default, all available CPUs also are booted. If you want to change the default, you can set the SYSGEN parameter SMP_CPUS to tell the system which secondary CPUs to boot. For information on SYSGEN parameters that affect multiprocessing, see the *VMS System Generation Utility Manual*.

4.1.1 Booting from a Local Disk Drive

To boot the system from a local disk drive, follow these steps:

- 1 If the VMS operating system is not running, go to step 2.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the system shuts down, the procedure displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

- 2 Press Ctrl/P to put the system in console mode.
- 3 Enter the BOOT command in the following format:

```
>>> BOOT [/R5:a] /XMI:b /BI:c [/R3:d] DUu
```

Table 4-1 lists the qualifiers to the BOOT command.

Table 4-1 Boot Command Qualifiers (Local Disks)

Qualifier	Function
/R5:a	Deposits a value (a) into R5. This value affects the execution of VMB.EXE. The /R5 qualifier is optional.
/XMI:b	Specifies the XMI node number (b) of the node being accessed. Defaults to the lowest numbered I/O device.
/BI:c	Specifies the BI node number (c) of the node being accessed. Defaults to 0.
/R3:d	Required only if you are using Volume Shadowing phase I (see the <i>VAX Volume Shadowing Manual</i> for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the <i>VMS Volume Shadowing Manual</i> .
u	Specifies the unit number of the drive holding the system disk.

For example, suppose you want to boot a local disk with a unit number of 1 and your system has the following configuration:

- The disk is connected to the VAXBI at node 2.
- The VAXBI you are using is connected to the XMI at node 3.

Enter the following command and press Return:

```
>>> BOOT/XMI:3/BI:2 DU1
```

4.1.2 Booting from an HSC Disk Drive

To boot the system from an HSC disk drive, use the following procedure:

- 1 If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
- 2 If the VMS operating system is not running, go to step 3.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYSS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the system shuts down, the procedure displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

- 3 Press Ctrl/P to put the system in console mode.
- 4 Enter the BOOT command in the following format:

```
>>> BOOT [/R5:a] /XMI:b /BI:c [/R3:d] /NODE:e DUu
```

System Startup and Shutdown

4.1 Booting the System

Table 4-2 lists the qualifiers to the BOOT command.

Table 4-2 Boot Command Qualifiers (HSC Disks)

Qualifier	Function
/R5:a	Deposits a value (a) into R5. This value affects the execution of VMB.EXE. The /R5 qualifier is optional.
/XMI:b	Specifies the XMI node number (b) of the node being accessed. Defaults to the lowest numbered I/O device.
/BI:c	Specifies the BI node number (c) of the node being accessed and must be used with the /XMI qualifier. Defaults to 0.
/R3:d	Required only if you are using Volume Shadowing phase I (see the <i>VAX Volume Shadowing Manual</i> for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the <i>VMS Volume Shadowing Manual</i> .
/NODE:e	Specifies the HSC node number (e) of the node being accessed. The HSC node number is hexadecimal. You can specify a maximum of two HSC node numbers (if two HSCs are available).
u	Specifies the unit number of the drive holding the system disk.

For example, suppose you want to boot an HSC disk with a unit number of 1 and your system has the following configuration:

- The disk is connected to the VAXBI at node 2.
- The VAXBI you are using is connected to the XMI at node 3.
- The disk is available to two HSCs, node numbers 0E and 02.

Enter the following command and press Return:

```
>>> BOOT/XMI:3/BI:2/NODE:0E02 DU1
```

Specifying two HSCs gives the system an alternate route in case one is disabled.

4.1.3 Performing a Conversational Boot

A conversational boot is most commonly used in research and development environments and during software upgrades. Perform a conversational boot when you want to stop the boot process before it completes. The boot process stops after it loads SYS\$SYSTEM:SYSBOOT.EXE and displays the SYSBOOT> prompt. At the SYSBOOT> prompt you can enter certain SYSGEN commands to do the following:

- Look at system parameter values
- Change system parameter values
- Specify another parameter file

System Startup and Shutdown

4.1 Booting the System

- Specify another system startup command procedure
- Select the default system parameter file if you modified system parameters to values that render the system unbootable
- Specify a minimum startup

There are several ways to perform a conversational boot. The following procedure is the most direct:

- 1 If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.

- 2 If the VMS operating system is not running, go to step 3.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE - USE CONSOLE TO HALT SYSTEM
```

- 3 Press Ctrl/P to put the system in console mode.
- 4 To begin the conversational boot, enter the following command at the console-mode prompt (>>>):

```
>>> BOOT /R5:1 /XMI:a /BI:b [/R3:c] [/NODE:d] DUu
```

where:

- *a* is the XMI node number of the system disk.
- *b* is the VAXBI node number of the system disk.
- *c* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.
- *d* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
- *u* is the unit number of the drive holding the system disk.

- 5 At the SYSBOOT> prompt, you can enter any of the SYSGEN commands listed in Table 4-3. For more information about these SYSGEN commands, see the *VMS System Generation Utility Manual*.

System Startup and Shutdown

4.1 Booting the System

Table 4-3 SYSGEN Commands Used in SYSBOOT

Command	Description
CONTINUE	Resumes the boot procedure
DISABLE CHECKS	Inhibits checking of parameter values specified with the SET command
ENABLE CHECKS	Permits checking of parameter values specified with the SET command
HELP	Displays a summary of the SYSBOOT commands on the terminal
SET parameter-name	Establishes the value of a system parameter
SET/STARTUP	Sets the name of the system startup command procedure
SHOW [parameter]	Displays active, current, default, maximum, and minimum values for specific parameters; use qualifiers to display characteristics of parameters grouped by categories
USE [file-spec]	Specifies a parameter file to be used as a source of values (you must enter the entire file specification, including device and directory; you cannot specify a logical name)

- 6 When you finish using SYSGEN commands, enter the CONTINUE command to complete the BOOT process.

The following examples illustrate some operations you can perform during a conversational boot:

- You can enter the following commands to set a new value for the SYSGEN parameter WSMAX to 512 and to complete the boot procedure:

```
SYSBOOT> SET WSMAX 512
SYSBOOT> CONTINUE
```

When the VMS operating system displays the following message, the new SYSGEN parameter value becomes active.

```
SYSTEM job terminated at 19-JUN-1990 15:05:11.01
```

If you modified the system parameters to values that render the system unbootable, enter the following commands to boot using default values:

```
SYSBOOT> USE DEFAULT
SYSBOOT> CONTINUE
```

- You can also use the conversational boot to specify a minimum startup. For example, if you want to boot the system and avoid autoconfiguring all the peripheral devices, enter the following command:

```
SYSBOOT> SET STARTUP_P1 "MIN"
```

System Startup and Shutdown

4.1 Booting the System

The value of STARTUP_P1 is saved and affects future boot operations. After the operating system boots, you can run SYSGEN to reset STARTUP_P1. For example, enter the following commands to reset STARTUP_P1 to its default value (null):

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> USE CURRENT
SYSGEN> SET STARTUP_P1 ""
SYSGEN> WRITE CURRENT
SYSGEN> EXIT
```

4.1.4 Automatic Restart

The VMS operating system can restart automatically from the default boot device designated in ROM (read-only memory). This section describes the two types of automatic restarts: warm (Section 4.1.4.1) and cold (Section 4.1.4.2).

To manually restart the system using the Restart button, see Section 1.2.2.

4.1.4.1 Warm Start

If you set the lower key switch on your VAX 6000 series console to Auto Start, the system will restart automatically under the following conditions:

- When the system power comes on after a power failure
- After an error halt

This type of automatic restart is known as a **warm start** because the backup battery unit supplies enough power to preserve the contents of memory.

4.1.4.2 Cold Start—Setting a Default Disk

If you shut down your VAX 6000 system and then specify Y at the auto reboot prompt, the system will restart automatically only if you have designated a default boot device prior to the shutdown. This type of automatic restart is known as a **cold start** because the memory is reinitialized before the system reboots.

To specify a default boot device, use the SET BOOT command in the following format:

```
>>> SET BOOT DEFAULT ddu
```

Note: To use any SET command, the lower key switch must be in the Update position.

For example, if you want the default boot device to be DU0, enter the following and press Return:

```
>>> SET BOOT DEFAULT DU0
```

Because the /XMI and /BI qualifiers are not specified, the system uses their default values.

The next time you boot the system, enter the BOOT command and press Return:

```
>>> B
```

System Startup and Shutdown

4.1 Booting the System

The system boots from the device you have designated as the default boot device.

To clear the default designation, enter the following and press Return:

```
>>> SET BOOT DEFAULT
```

For more information on the SET command, see the owner's manual you received with your VAX 6000 series computer.

4.1.5 Booting with XDELTA

XDELTA is a debugging tool that system programmers use. To use XDELTA, you must boot the system differently. For more information on booting with XDELTA, see the *VMS Delta/XDelta Utility Manual*.

4.1.6 Booting from [SYSF] During an Upgrade

In the future, you might want to upgrade to the most recent version of the VMS operating system. During the upgrade procedure you must boot from the [SYSF] directory. To boot from [SYSF], do the following:

- 1 If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
- 2 Press Ctrl/P to put the system in console mode.
- 3 Enter the BOOT command in the following format:

```
>>> BOOT /R5:F0000000 /XMI:a /BI:b [/R3:c] [/NODE:d] DUu
```

where:

- *a* is the XMI node number of the system disk.
- *b* is the VAXBI node number of the system disk.
- *c* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.
- *d* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
- *u* is the unit number of the drive holding the system disk.

For example, suppose you want to boot from [SYSF] on an HSC disk with a unit number of 1 and your system has the following configuration:

- The disk is connected to the VAXBI at node 2.
- The VAXBI you are using is connected to the XMI at node 3.
- The disk is available to two HSCs, node numbers 0E and 02.

Enter the following command and press Return:

```
>>> BOOT/R5:F0000000/XMI:3/BI:2/NODE:0E02 DU1
```

4.1.7 Booting from a Different Directory on the System Disk

The VMS operating system is installed in the system root directory named [SYS0]. You can use VMSKITBLD, as described in the *Guide to Setting Up a VMS System*, to add a copy of the VMS operating system to another system root directory on the system disk.

To boot from a different directory on the system disk, use the following procedure:

- 1 If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
- 2 If the VMS operating system is not running, go to step 3.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE - USE CONSOLE TO HALT SYSTEM
```

- 3 Press Ctrl/P to put the system in console mode.
- 4 Enter the BOOT command in the following format:

```
>>> BOOT /R5:a0000000 /XMI:b /BI:c [/R3:d] [/NODE:e] DUu
```

where:

- *a* is the name of the root directory from which you want to boot.
- *b* is the XMI node number of the system disk.
- *c* is the VAXBI node number of the system disk.
- *d* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.
- *e* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
- *u* is the unit number of the drive holding the system disk.

For example, suppose you want to boot from [SYSC] on an HSC disk with a unit number of 1 and your system has the following configuration:

System Startup and Shutdown

4.1 Booting the System

- The disk is connected to the VAXBI at node 2.
- The VAXBI you are using is connected to the XMI at node 3.
- The disk is available to two HSCs, node numbers 0E and 02.

Enter the following command and press Return:

```
>>> BOOT/R5:C0000000/XMI:3/BI:2/NODE:0E02 DU1
```

4.1.8 Using SET BOOT

Instead of entering the whole BOOT command every time you boot the system, you can equate the command to a "nickname." Nicknames can be up to four characters long. To give a BOOT command a nickname, use the SET BOOT command in the following format:

```
>>> SET BOOT nickname [boot-parameters]
```

Note: To use any SET command, the lower key switch must be in the Update position.

For example, suppose you want to assign a nickname to the following BOOT command:

```
BOOT/XMI:2/BI:2 DU0
```

Enter the following command and press Return:

```
>>> SET BOOT WORK /XMI:2/BI:2 DU0
```

Note: Avoid using nicknames that can be confused with the name of an actual boot device. For example, you would not want to use DU0 as a nickname if there is a drive on the system named DU0.

The next time you need to boot from DU0, enter the following and press Return:

```
>>> BOOT WORK
```

To clear the value of the nickname, enter the following and press Return:

```
>>> SET BOOT nickname
```

For more information on the SET command, see the owner's manual for your computer.

4.1.9 If the System Does Not Boot

If the system does not boot because a hardware problem occurs, a question mark (?) usually precedes the error message displayed on the console terminal. Examples of hardware problems are a read error on a disk drive or a console tape cartridge, or a machine check error. If you suspect a hardware problem, do the following:

- Consult the hardware manual for your VAX computer.
- Contact your Digital Customer Services representative.

When the operating system is loaded into memory, a message similar to the following appears on the terminal screen:

```
%SET-I-INTSET, login interactive limit=64, current interactive value = 0
19-JUN-1990 15:00:00.00
SYSTEM      job terminated at 19-JUN-1990 15:00:00.00

Accounting information:
Buffered I/O count:      133      Peak working set size:      401
Direct I/O count:       12      Peak pagefile size:      2379
Page faults:           325      Mounted volumes:      0
Charged CPU time: 0 00:00:55.23  Elapsed time:      0 00:01:31.24
```

If the system does not display this message, a software problem might have occurred. If you suspect a software problem, do the following:

- Try booting the system again.
- Place a backup copy of the system disk into another drive and try to boot from it.

4.2 Shutting Down the System

Before you shut down the operating system, decide if you want it to reboot automatically or if you want to enter console-mode commands after the shutdown completes.

If you want the system to reboot automatically after the shutdown, you must first designate a default boot device in ROM (read-only memory), as described in Section 4.1.4.2.

You can perform the following types of shutdown operations:

- **An orderly shutdown with SYSS\$SYSTEM:SHUTDOWN.COM** (Section 4.2.1.)
- **An emergency shutdown with OPCCRASH.EXE** (Section 4.2.2.)
- **An emergency shutdown with CRASH commands** (Section 4.2.3.)

4.2.1 Orderly Shutdown with SYSS\$SYSTEM:SHUTDOWN.COM

This procedure shuts down the system while performing maintenance functions such as disabling future logins, stopping the batch and printer queues, dismounting volumes, and stopping user processes. To use the SHUTDOWN command procedure, log in to the SYSTEM account, enter the following command, and press Return:

```
$ @SYSS$SYSTEM:SHUTDOWN
```

To halt the system after the procedure completes, press Ctrl/P.

For more information about the SHUTDOWN command procedure, see the *Guide to Setting Up a VMS System*.

System Startup and Shutdown

4.2 Shutting Down the System

4.2.2 Emergency Shutdown with OPCCRASH.EXE

If you cannot perform an orderly shutdown with SHUTDOWN.COM, run the OPCCRASH emergency shutdown program. Enter the following command and press Return:

```
$ RUN SYS$SYSTEM:OPCCRASH
```

To halt the system after the procedure completes, press Ctrl/P.

For more information about the OPCCRASH program, see the *Guide to Setting Up a VMS System*.

4.2.3 Emergency Shutdown with CRASH Commands

Note: Use this emergency shutdown procedure only if the system is hung and you cannot log in to SYSTEM to use SHUTDOWN or OPCCRASH.

To force your VAX computer to fail, do the following:

- 1 Set the upper key switch to Enable.
- 2 Press Ctrl/P to put the system in console mode.
- 3 Enter the following commands. The system displays a value in response to each of the EXAMINE commands. For example:

```
>>> E/I 0          I      00000000      7FFE7CE0
>>> E/I 1          I      00000001      7FFE9D88
>>> E/I 2          I      00000002      7FFED04E
>>> E/I 3          I      00000003      0001FACB
>>> E/I 4          I      00000004      80631200
>>> E PSL
04030004
>>> D PSL 041F0000
>>> D PC  FFFFFFFF
```

Depositing these values in the program counter (PC) and the processor status longword (PSL) causes an exception condition that sends the contents of memory to a dump file on the system disk.

- 4 Enter the following command and press Return:

```
>>> C
```

System Startup and Shutdown

4.2 Shutting Down the System

- 5 The system displays a fatal bugcheck message, and other messages, similar to the following:

```
**** FATAL BUG CHECK, VERSION = 5.4 INVEXCEPTN, Exception while above ASTDEL or on interrupt stack
CRASH CPU: 02          PRIMARY CPU: 02
ACTIVE/AVAILABLE CUP MASKS: 00000016/00000016
CURRENT PROCESS = NULL
REGISTER DUMP
R0 = 0000001F
.
.
**** MEMORY DUMP COMPLETE....
>>>
```

- 6 If the system does not reboot automatically, reboot it.
- 7 After the system reboots, you can examine the dump file. Log in to the SYSTEM account.
- 8 Enter the following commands. Press Return after each one.

```
$ ANALYZE/CRASH SYS$SYSTEM:SYSDUMP.DMP
SDA> SHOW CRASH
```

For more information about the System Dump Analyzer (SDA), see the *VMS System Dump Analyzer Utility Manual*.

System Startup and Shutdown

13 Shutting Down the System

The system shutdown is initiated by the user and the system shutdown is initiated by the user.

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5 Backup Procedures

Use standalone BACKUP to make a complete backup of the system disk. Standalone BACKUP is a subset of the VMS Backup Utility that runs without the support of the entire VMS operating system.

You should back up the system disk for the following reasons:

- In case a problem occurs during a VMS upgrade or update, or during the installation of other software products. *Before* you attempt any of these procedures, you should back up the system disk. If a problem occurs, you can restore the backup copy of the system disk.
- To prevent loss of system files if they are accidentally deleted. *After* you install or upgrade the VMS operating system, or any other software products, you should back up the system disk. If a system file is deleted and renders the system disk inoperable, you can restore the backup copy and continue to use the system.
- In case the drive that holds the system disk malfunctions. If you have a backup copy of the VMS operating system, you can restore it to a functioning disk and continue to use the system.
- To eliminate disk fragmentation, which happens when files are stored noncontiguously on the disk. The BACKUP command creates a copy on which files are stored contiguously.
 - If the system disk is removable and you have more than one disk drive, eliminating disk fragmentation is a one-step process. Use the backup copy as the new system disk. Store the old system disk in a safe place.
 - If your system disk is fixed, back it up to a disk or magnetic tape. Then restore the files to the original system disk.

This chapter describes the following:

- Using standalone BACKUP (Section 5.1)
- Installing and booting standalone BACKUP using the system disk (Section 5.1.1 and Section 5.1.2)
- Installing and booting standalone BACKUP using a tape cartridge (Section 5.1.3 and Section 5.1.4)
- Booting standalone BACKUP from a compact disc (CD) (Section 5.1.5)
- Backing up and restoring the system disk (Section 5.2 and Section 5.3)

Backup Procedures

5.1 Using Standalone BACKUP

5.1 Using Standalone BACKUP

The VMS Backup Utility lets you create and restore backup copies of files, directories, and user disks. However, because the Backup Utility copies only what is on the disk, and ignores sections of any open files contained in memory, you should use it to back up user disks, not the system disk. If you use the Backup Utility to create a copy of the system disk, the resulting backup copy will not contain portions of the files that were in memory or data about files not yet written back to the disk (cache).

Before you use standalone BACKUP, you must shut down the VMS operating system. The shutdown procedure sends the contents of the caches back to the disk and closes any open files. By shutting down the system and using standalone BACKUP, you can make an exact copy of the system disk.

For VAX 6000 series systems, standalone BACKUP exists on either a tape cartridge or a compact disc, depending on the distribution media you received. Using either of those media, you can install standalone BACKUP on the system disk (which Digital recommends because booting standalone BACKUP from the system disk saves time). However, you should also retain the original compact disc or tape cartridge, or make a copy of standalone BACKUP on another tape cartridge, in case the system disk becomes damaged. The following sections describe standalone BACKUP installation and booting procedures for the system disk, tape cartridge, and compact disc.

5.1.1 Installing Standalone BACKUP on the System Disk

Digital has established [SYSE] on the system disk as the default directory for standalone BACKUP. To install standalone BACKUP in [SYSE], use the following procedure:

- 1 Log in to the SYSTEM account.
- 2 Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT SYS$SYSDEVICE:
```

The procedure places the files in the directories [SYSE.SYSEXEXE] and [SYSE.SYS\$LDR] on the system disk. It lists the files as they are copied. When the procedure finishes, it displays the following message:

The kit is complete.

- 3 To boot standalone BACKUP from the system disk, go to Section 5.1.2.

5.1.2 Booting Standalone BACKUP from the System Disk

To boot standalone BACKUP from the system disk, follow these steps:

- 1 If your system has a CIBCA-A, insert the console tape cartridge into the console drive.
- 2 If the VMS operating system is not running, go to step 3.

Backup Procedures

5.1 Using Standalone BACKUP

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYSS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

3 Press Ctrl/P to halt the system.

4 Enter the BOOT command in the following format:

```
>>> B /R5:E0000000 /XMI:a /BI:b [/NODE=c] DUu
```

where:

- *a* is the XMI node number of the system disk.
- *b* is the VAXBI node number of the system disk.
- *c* is the HSC node number of the node being accessed. You do not need to specify the /NODE qualifier if you are booting from a local disk.
- *u* is the unit number.

5 Standalone BACKUP displays the following message:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

6 The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

7 The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

```
Available device MINE$DUA0:          device type RA81
Available device MINE$DJA3:          device type RA60
```

```
.
```

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

8 When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Standalone BACKUP V5.4; the date is 19-JUN-1990 15:30
$
```

To make a backup copy of the system disk, go to Section 5.2.

To restore the system disk, go to Section 5.3.

Backup Procedures

5.1 Using Standalone BACKUP

5.1.3 Installing Standalone BACKUP on a Tape Cartridge

You should have received standalone BACKUP on the tape cartridge or compact disc included in your distribution kit. Digital recommends that you keep a copy of standalone BACKUP on another tape cartridge in case the system disk, original distribution compact disc, or original distribution tape cartridge becomes damaged, or in case you need to make extra copies. To install standalone BACKUP on a tape cartridge, use the following procedure:

- 1 Obtain one blank tape cartridge. Write a name on the paper label that identifies the contents of that tape cartridge. For example, you could use the name S/A BKUP V5.4 to indicate that the tape cartridge contains a copy of the Version 5.4 standalone BACKUP kit. Insert the label into the label slot.

- 2 Make sure the tape cartridge is write-enabled.

- 3 Insert the tape cartridge into the drive.

- 4 Log in to the SYSTEM account.

- 5 Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT
```

- 6 The procedure asks you for the name of the target device. Enter the device name of the tape cartridge drive and press Return. For example:

Enter the name of the device on which to build the kit: MUC6:

- 7 After you enter the name of the target device, the procedure displays several informational messages and the following message:

```
Please place the scratch tape cartridge in drive _MUC6:
This volume will receive the volume label SYSTEM.
```

```
Enter "YES" when ready:
```

When you are ready to continue, enter Y (for YES) and press Return.

- 8 The system displays verification messages informing you that files are being copied. When standalone BACKUP is installed, the procedure displays a message similar to the following:

```
Ending time 19-JUN-1990 16:44:29.90
Starting time 19-JUN-1990 16:30:39.05
```

```
The Kit is complete.
```

```
$
```

- 9 Remove the tape cartridge from the tape cartridge drive.

- 10 Write-protect the tape cartridge and store it in a safe place.

Backup Procedures

5.1 Using Standalone BACKUP

5.1.4 Booting Standalone BACKUP from a Tape Cartridge

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from a tape cartridge. Booting standalone BACKUP from a tape cartridge takes approximately 15 minutes. You need a tape cartridge that contains standalone BACKUP (either the original distribution tape cartridge or a copy). To boot standalone BACKUP from a tape cartridge, use the following procedure:

- 1 If the VMS operating system is not running, go to step 2.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

- 2 Press Ctrl/P to halt the system.
- 3 If your system has a CIBCA-A, insert the console tape cartridge into the console drive.
- 4 Enter the following command and press Return:

```
>>> B CSA1
```

- 5 The procedure displays a self-test message similar to the following:

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	NODE #
	A	A	.	.	.	M	M	M	M	.	P	P	P	P		TYP
	O	O	.	.	.	+	+	+	+	.	+	+	+	+		STF
	.	.	.	.	.	.	.	.	.	.	E	E	E	B		BPD
	.	.	.	.	.	.	.	.	.	.	+	+	+	+		ETF
	.	.	.	.	.	.	.	.	.	.	E	E	E	B		BPD
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	XBI D -
.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.	XBI E +
.	.	.	.	.	.	A4	A3	A2	A1	.	.	.	.	.	.	ILV
.	.	.	.	.	.	32	32	32	32	.	.	.	.	.	.	128 Mb

```
ROM = 1.0  EEPROM = 1.0/1.0  SN = NIO128
```

```
Loading system software.
```

```
Please remove the volume "CONSOL" from the console device.
```

```
Insert the first standalone system volume and enter "YES" when ready:
```

- 6 If the console tape cartridge is in the console drive, remove it. Insert the tape cartridge that contains standalone BACKUP. When you are ready to continue, enter Y and press Return.

Standalone BACKUP displays a message similar to the following:

```
Resuming load operation on volume 'SYSTEM', please stand by...
```

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

Backup Procedures

5.1 Using Standalone BACKUP

- 7 The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00

- 8 The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

```
Available device  MINE$DUA0:          device type RA81
Available device  MINE$DJA3:          device type RA60
```

.

.

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

- 9 When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, standalone BACKUP V5.4; the date is 19-JUN-1990 15:30
$
```

- 10 Remove the tape cartridge containing standalone BACKUP from the tape cartridge drive.

To back up the system disk, go to Section 5.2.

To restore the system disk, go to Section 5.3.

5.1.5 Booting Standalone BACKUP from a Remote Compact Disc

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from a remote compact disc (CD) that is connected to an InfoServer system. You will need the distribution compact disc (which contains standalone BACKUP) supplied in your original VMS kit.

Note: The following procedure applies *only* to VAX 6000 series computers capable of booting from a remote compact disc drive, such as an Ethernet-based InfoServer system equipped with RRD40 compact disc drives. To make sure your VAX 6000 series system has this capability, review all relevant cover letters and the *VMS Release Notes*. You should also read Chapter 2 in this supplement and the owner's manuals or booklets supplied with your InfoServer system, RRD40 compact disc drive, and VMS distribution compact disc.

To boot standalone BACKUP from a remote compact disc, use the following procedure:

- 1 If the VMS operating system is not running, go to step 2.

If the VMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Backup Procedures

5.1 Using Standalone BACKUP

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

- 2 Press Ctrl/P to halt the system.
- 3 Place the VMS distribution compact disc in the remote compact disc drive (in this case, an RRD40 compact disc drive connected to an Ethernet-based InfoServer system). If your system contains a CIBCA-A, make sure the console tape cartridge is in the console drive.
- 4 Make sure your system is physically connected to the *same* Ethernet cable as the InfoServer.
- 5 Enter the following command and press Return:

```
>>> SHOW ETHERNET
```

In this example, the system displays information about the Ethernet controllers present on the XMI and VAXBI buses, using the following format:

```
XMI:x BI:y nn-nn-nn-nn-nn
```

where:

- *x* is the XMI node value.
- *y* is the BI node value.
- *nn-nn-nn-nn-nn* is the hexadecimal representation of the Ethernet controller's unique address. Keeping a list of each Ethernet address and corresponding processor (CPU) with that address can help you find which systems are generating specific messages.

- 6 To boot standalone BACKUP on a VAX 6000 series system from across the Ethernet, enter the following command, specifying the XMI and BI values displayed previously by the SHOW ETHERNET command. Then, press Return. For example:

```
>>> BOOT/XMI:D/BI:6/R5:100 ET0
```

Note in the previous example of booting standalone BACKUP that ET0 represents the Ethernet port to the boot device. However, if your system requires EX as the boot device name instead (see Table 3-1), boot standalone BACKUP by entering the following command:

```
>>> BOOT/XMI:D/R5:100 EX0
```

- 7 The procedure displays a self-test message similar to the following:

Backup Procedures

5.1 Using Standalone BACKUP

```

F E D C B A 9 8 7 6 5 4 3 2 1 0  NODE #
A A . . . M M M M . P P P P  TYP
O O . . . + + + + . + + + +  STF
. . . . . . . . . E E E B  BPD
. . . . . . . . . + + + +  ETF
. . . . . . . . . E E E B  BPD
. . . . . . . . . . . . .  XBI D -
. . . . . . . . . + . . . +  XBI E +
. . . . . A4 A3 A2 A1 . . . .  ILV
. . . . . 32 32 32 32 . . . . 128 Mb

```

ROM0 = 2.00 ROM1 = 2.00 EEPROM = 1.00/1.00 SN = NIO128

Loading system software.

(Note that ROM version numbers will be different for VAX 6000 series systems with upgraded console ROMs.)

- 8 After the system displays its self-test message, it prompts you for a file name, as follows:

Filename:

- 9 In response to the prompt, enter the following and press Return:

Filename: **ISL_LVAX**

Several informational console messages are displayed.

- 10 The system then displays the following:

Ethernet Initial System Load Function

Function ID	Function
1 -	Display Menu
2 -	Help
3 -	Choose Service
4 -	Stop

Enter a function ID value:

This display indicates that the Initial System Load (ISL) image is loaded, which means you can now locate the InfoServer services present on your Ethernet. Note that the term **service**, in this context, refers to any drive and media combination that is connected to an InfoServer system. In this example, the service is the RRD40 compact disc drive (connected internally or externally to the InfoServer, as described in Chapter 2) containing the VMS Version 5.4 Compact Disc.

- 11 Continue the procedure by entering 3 (for Function ID item number 3, Choose Service) and then pressing Return:

Enter a function ID value: **3**

The next display is as follows:

Service options:

```

1 = Find Service
2 = Enter Known Service Name
=>

```

Backup Procedures

5.1 Using Standalone BACKUP

- 12** Enter **1** and then press Return. The message "Working" indicates that the ISL image is searching for all InfoServer services present on the Ethernet.

Service options:

1 = Find Service
2 = Enter Known Service Name
=> **1**

Working

- 13** After the ISL image completes its search, the system displays the list of known service names. For example:

Servers found:: 1

Service Names Format:

Service Name
Server Name
Ethernet ID

#1
VMS052
DIS_08002b150589
08-00-2b-15-05-89

#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number =>

- 14** To boot standalone BACKUP from the VMS Version 5.4 distribution compact disc, enter **2** and then press Return:

Servers found:: 1

#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number => **2**

- 15** The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) **19-JUN-1990 15:00**

- 16** The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

Configuring devices . . .

Available device	DAD1:	device type	RRD40
Available device	\$DUA0:	device type	RA81
Available device	MINE\$DJA3:	device type	RA60

Enter "YES" when all needed devices are available:

Backup Procedures

5.1 Using Standalone BACKUP

Note that DAD1: is the device name of the InfoServer service you are booting from, in this case an RRD40 compact disc (connected to the InfoServer) containing the VMS Version 5.4 distribution compact disc. If that device or other devices fail to appear in the list, make sure that all the drives are properly connected to the system before you enter YES at the prompt. See your hardware manuals for details.

- 17 When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Stand-alone BACKUP V5.4; the date is 19-JUN-1990 15:10
$
```

To back up the system disk, go to Section 5.2.

To restore the system disk, go to Section 5.3.

5.2 Backing Up the System Disk

Standalone BACKUP uses a subset of Backup Utility qualifiers to back up and restore your system disk. It is especially important that you understand the functions of the /IMAGE and /PHYSICAL qualifiers to the BACKUP command before using standalone BACKUP.

Qualifier	Function
/IMAGE	Lets you create a functionally equivalent copy of the entire system disk. It also eliminates disk fragmentation.
/PHYSICAL	Copies, saves, restores, or compares the entire system disk in terms of logical blocks, ignoring any file structure.

For a complete description of the Backup Utility and its qualifiers, see the *VMS Backup Utility Manual*.

To back up the system disk, use the following procedure:

- 1 Obtain a scratch disk or tape cartridge that you can use for the backup copy. Place it in the appropriate drive. If you are using a tape cartridge, write-enable it (to write-enable a tape cartridge, slide the write-protect switch away from the tape cartridge label). If you are using a disk, spin up the drive.
- 2 Write-protect the system disk by pressing the Write Protect button on the disk drive.
- 3 Boot standalone BACKUP as described in Section 5.1.2, Section 5.1.4, or Section 5.1.5.
- 4 Determine the device names of the drive holding the system disk and the drive holding the backup disk or tape cartridge. For a list of device codes, see Table 3-1.
- 5 Enter the BACKUP command in one of the following formats. If you are backing up the system disk to another disk, use the first command. If you are backing up the system disk to a tape cartridge, use the second command.

Backup Procedures

5.2 Backing Up the System Disk

```
$ BACKUP/IMAGE/VERIFY source-drive: target-drive:
```

```
$ BACKUP/IMAGE/VERIFY source-drive: target-drive:saveset.BCK/REWIND/LABEL=volume-label
```

These commands use the following variables:

- *source-drive* is the location of the files you want to back up. Use the device name of the drive holding the system disk.
- *target-drive* is the destination. Use the device name of the drive holding the backup disk or tape cartridge.
- *saveset.BCK* is the name of the save set (the name should reflect the contents of the tape and cannot exceed 17 characters in length).
- *volume-label* is the volume label of the tape cartridge in the target drive. If the tape cartridge has already been initialized, use the same volume label that was assigned by the INITIALIZE command. If the tape cartridge has not been initialized, you can assign a volume label at this time. The volume label can have up to six characters.

The following example uses the BACKUP command to make a backup disk. You can use a backup disk as the system disk.

```
$ BACKUP/IMAGE/VERIFY DUA0: DUA1:
```

The following example uses the BACKUP command to make a backup tape cartridge. The contents of a backup tape cartridge have to be restored to a disk before you can use them.

```
$ BACKUP/IMAGE/VERIFY DUB3: MUC6:JUN_19_BACK.BCK/REWIND/LABEL=SYSDSK
```

6 Standalone BACKUP displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

7 If you are backing up the system disk to another disk, go to step 8.

If you are backing up the system disk to a tape cartridge and the system disk contains more data than one tape cartridge can store, the procedure displays the following messages:

```
%BACKUP-I-RESUME, Resuming operation on volume 2
```

```
%BACKUP-I-READYWRITE, Mount volume 2 on MUC6: for writing  
Enter "YES" when ready.
```

If the system does not display these messages, go to step 8.

If the system displays these messages, follow steps a through e.

- Remove the backup tape cartridge from the drive.
- Label it COMPLETE SYSTEM BACKUP, number it, and include the date.
- Write-protect the tape cartridge.
- Write-enable another scratch tape cartridge and insert it into the drive.
- Enter Y and press Return. Standalone BACKUP then displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

Backup Procedures

5.2 Backing Up the System Disk

Each time the procedure displays a mount request, follow steps a through e.

- 8 When the procedure is finished, it displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990 15:45
```

If you do not want to perform another standalone BACKUP operation, use the console to halt the system.

If you do want to perform another standalone BACKUP operation, ensure the standalone application volume is online and ready. Enter "YES" to continue:

- 9 Remove the backup tape cartridge from the drive. Label it COMPLETE SYSTEM BACKUP and include the number of the tape cartridge in the backup sequence (if you used more than one tape). Also mark the date and the volume label on the label of the tape cartridge.
- 10 Press Ctrl/P to halt the system.
- 11 Reboot the system.

Store the backup copy of the system disk in a safe place.

Note: The BACKUP command creates a system disk that includes a Digital-supplied set of volume parameters, including CLUSTER_SIZE. (The CLUSTER_SIZE parameter refers to the way files are stored on the disk, NOT to VAXclusters.) You can change most volume parameters later with the SET VOLUME command. However, to change the CLUSTER_SIZE parameter you must back up the system disk to a disk that has been previously initialized with the CLUSTER_SIZE parameter that you want. To prevent the BACKUP command from reinitializing the target disk, use the /NOINITIALIZE qualifier. For more information about initializing a disk, see the *Guide to Maintaining a VMS System*. For more information on the BACKUP command, see the *VMS Backup Utility Manual*.

5.3 Restoring the System Disk

To restore the system disk, use the following procedure:

- 1 Write-protect the backup disk or tape cartridge
- 2 Insert the backup disk or tape cartridge into the appropriate drive. If you are using a tape cartridge drive, put it on line. If you are using a disk drive, spin it up.
- 3 Boot standalone BACKUP as described in Section 5.1.2, Section 5.1.4, or Section 5.1.5.
- 4 Place a scratch disk in the drive you intend to use for the new system disk. Spin it up but do not write-protect it.
- 5 Determine the device names of the drive holding the system disk and the drive holding the backup disk or tape cartridge. For a list of device codes, see Table 3-1.

Backup Procedures

5.3 Restoring the System Disk

- 6 Enter the BACKUP command in one of the following formats. Use the first command if you have a backup disk. Use the second command if you have a backup tape cartridge.

```
$ BACKUP/IMAGE/VERIFY source-drive: target-drive:
```

```
$ BACKUP/IMAGE/VERIFY source-drive:saveset.BCK/REWIND target-drive:
```

These commands use the following variables:

- *source-drive* is the location of the files you want to restore. Use the device name of the drive holding the backup disk or tape cartridge.
- *saveset* is the name of the save set (if you have a backup tape cartridge).
- *target-drive* is the destination. Use the device name of the drive holding the system disk.

The following example uses the BACKUP command to restore the system disk from a backup tape cartridge:

```
$ BACKUP/IMAGE/VERIFY MUC6:JUN_19_BACK.BCK/REWIND DUB3:
```

- 7 Standalone BACKUP displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

If the backup copy of the system disk is another disk or *one* tape cartridge, go to step 9.

- 8 If the backup copy of the system disk consists of several tape cartridges, the procedure displays the following message:

```
%BACKUP-I-RESUME, Resuming operation on volume 2
```

```
%BACKUP-I-READYREAD, Mount volume 2 on MUA1: for reading  
Enter "YES" when ready.
```

Continue the restore operation as follows:

- a. Remove the backup tape cartridge from the drive.
- b. Insert the next backup tape cartridge into the drive.
- c. When you are ready to continue, enter Y (for YES) and press Return. The procedure displays the following message:

```
%BACKUP-I-STARTVERIFY, starting verification pass
```

Each time the procedure displays a mount request, follow steps a through c. When the procedure finishes, it displays the following message:

```
%BACKUP-I-PROCDONE, Operation completed. Processing finished at 19-JUN-1990 15:50
```

If you do not want to perform another standalone BACKUP operation, use the console to halt the system.

If you do want to perform another standalone BACKUP operation, ensure the standalone application volume is online and ready. Enter "YES" to continue:

Backup Procedures

5.3 Restoring the System Disk

- 9 Press Ctrl/P to halt the system.
- 10 Reboot the system.
- 11 Store the backup copy in a safe place.

A

How the System Assigns Controller Letters

The system assigns a letter to each controller on the XMI and VAXBI buses in order, starting with the controller that has the lowest XMI node number and continuing with the controller having the lowest VAXBI node number. If the system has more than one VAXBI, the system begins assigning controller letters on the VAXBI with the lowest XMI node number.

The system assigns a unique controller letter to each controller type, starting with the letter A. For example, if a system has three KDB50s (controller type DU), the first KDB50 disk controller is assigned the letter A, the second B, and the third C. If the same system has three KLESI-Bs (controller type MU), the first KLESI-B tape controller is assigned the letter A, the second B, and so on.

The KDM70 controller is an exception to this rule because it supports both disk and tape devices. Therefore, when the system finds a KDM70, it must reserve the same disk and tape controller letter for both the DU and MU device names. If necessary, the system skips unassigned disk or tape controller letters to make sure the KDM70 uses the same letter for the disk and tape designation. This exception applies only to controller letter assignments for disk (DU) and tape (MU) devices. Devices such as the DEBNA (ET) or DEMNA (EX), which are neither disk nor tape controllers, are unaffected.

The system always assigns the controller letter A to the following:

- CIXCD and CIBCA—HSC disk or tape drives attached to the CI using the CIXCD and CIBCA are uniquely identified by the HSC's allocation class.
- DEBNA and DEMNA—These controllers serve as ports to the Ethernet.

The system does *not* assign controller letters to the DWMBA, KA62A, or MS62A.

The following example shows how the system assigns controller letters. Note that the XMI and VAXBI node numbers appear in ascending order, beginning with numerical and then alphabetical designations.

How the System Assigns Controller Letters

>>> SHOW CONFIGURATION

	Type	Code	Rev
1+	KDM70 ^①	(0C22)	36F0
2+	CIXCD ^②	(0C05)	8220
3+	DEMNA ^③	(0C03)	0600
4+	DWMBA/A ^④	(2001)	0001
5+	KDM70 ^①	(0C22)	36F0
6+	DWMBA/A ^②	(2001)	0001
7-	KA62A ^⑥	(8001)	0001
E+	MS62A ^⑦	(4001)	0001
H+	KDM70 ^①	(0C22)	36F0
XBI 4			
1-	DWMBA/B ^⑤	(0107)	FFF0
5+	KDB50 ^⑥	(010E)	0F1C
6+	KLESI-B ^⑦	(0103)	0006
7+	DEBNA ^⑧	(410F)	023B
8+	CIBCA ^⑨	(0108)	0002
9+	TBK50 ^⑩	(410E)	0001
XBI 6			
1-	DWMBA/B ^⑤	(0107)	FFF0
3+	KLESI-B ^⑦	(010E)	0F1C
5+	KDB50 ^⑥	(010E)	0F1C

- ① The first section of this display lists all the nodes on the XMI (nodes 1 through F). Because the KDM70 has the lowest node number (1) on the XMI, the system assigns the controller letter A. In this case, because the KDM70 supports disk and tape devices, the system reserves *both* DUA (disk) and MUA (tape).
- ② The CIXCD is designated PAA. HSC disk or tape drives that are attached to this controller use the letter A.
- ③ The DEMNA is designated EXA.
- ④ The next lowest XMI node number (4) is a VAXBI. The system does not assign a controller letter to the DWMBA (the 2-module interface to the VAXBI) but does assign controller letters to the devices on that VAXBI, beginning with the lowest node number.
- ⑤ The second module of the DWMBA interface. It is not assigned a controller letter.
- ⑥ The device with the lowest VAXBI node number (5) is a KDB50. Because the system has already reserved the letter A for the KDM70 disk and tape controller (DUA and MUA) connected to the XMI (described previously in step 1), the KDB50 disk controller is designated DUB.
- ⑦ Because the system has already reserved the tape drive designation MUA for the KDM70 (described previously in step 1), the next device on the VAXBI, the KLESI-B tape controller, is designated MUB.
- ⑧ The DEBNA is designated ETA.
- ⑨ The CIBCA is designated PAA. HSC disk or tape drives that are attached to this controller have the controller letter A.
- ⑩ The TBK50 tape controller is designated MUC. It cannot use the letter B because the KLESI-B has already been designated MUB.

How the System Assigns Controller Letters

- 11 The next lowest node number (5) on the XMI is a KDM70. Although the disk controller letter assignment DUC has not been used (MUC is not available, having already been assigned to the TBK50), the system skips to DUD so it can reserve the same letter (D) for the disk and tape devices supported by the KDM70: DUD and MUD.
- 12 The next lowest XMI node number (6) is a VAXBI. The system does not assign a controller letter to the DWMBA (the 2-module interface to the VAXBI) but does assign controller letters to the devices on that VAXBI, beginning with the lowest node number.
- 13 The second module of the DWMBA interface. It is not assigned a controller letter.
- 14 The device with the lowest node number (3) on this VAXBI is a KLESI-B. Because the letter D has already been reserved for a KDM70 tape device (described previously in step 11), the system designates the KLESI-B tape controller as MUE.
- 15 The next device, a KDB50 disk controller, is designated DUE.
- 16 The KA62A is not assigned a controller letter.
- 17 The MS62A is not assigned a controller letter.
- 18 The next (and last) controller on the XMI is a KDM70. Because the letter E has already been assigned to disk and tape controllers connected to the second VAXBI (XMI node 6), the system reserves DUF and MUF for this KDM70 disk and tape controller.

Table A-1 summarizes how the system assigned the controller letters in this example.

Table A-1 Controller Naming Example

Device	DU	MU	ET	PA	EX
KDM70	A	A			
CIXCD				A	
DEMNA					A
KDB50	B				
KLESI-B		B			
DEBNA			A		
CIBCA				A	
TBK50		C			
KDM70	D	D			
KLESI-B		E			
KDB50	E				
KDM70	F	F			

How the System Assigns Controller Labels

- 1. The first step is to determine the number of controllers to be assigned. This is done by dividing the total number of controllers by the number of systems. For example, if there are 10 controllers and 2 systems, then 5 controllers will be assigned to each system.
- 2. The next step is to assign the controllers to the systems. This is done by using a random number generator to select a controller for each system. The controller is then assigned to the system and the process is repeated until all controllers are assigned.
- 3. The final step is to verify the assignment. This is done by checking the number of controllers assigned to each system. If the number of controllers assigned to each system is equal to the number of controllers divided by the number of systems, then the assignment is correct.

Table 1: Controller Assignment Results

System	Controller 1	Controller 2	Controller 3	Controller 4	Controller 5
System A	1	2	3	4	5
System B	6	7	8	9	10
System C	11	12	13	14	15
System D	16	17	18	19	20
System E	21	22	23	24	25
System F	26	27	28	29	30
System G	31	32	33	34	35
System H	36	37	38	39	40
System I	41	42	43	44	45
System J	46	47	48	49	50

B Writing a New Boot Block on the System Disk

When booting, certain processors must read a **boot block** on the system disk to locate the bootstrap image (VMB.EXE). The information written in the boot block specifies the location and size of VMB.EXE so the system can read it into memory.

If you suspect that the boot block on the system disk is corrupted (which can sometimes occur if you do not specify the /IMAGE qualifier when backing up the system disk), you can rewrite the boot block using the Writeboot Utility.

Note: You must have LOG_IO privilege to use the Writeboot Utility.

To write a boot block on a system disk, use the following procedure:

- 1 To start the Writeboot Utility, enter the following command and press Return:

```
$ RUN SYS$SYSTEM:WRITEBOOT
```

The procedure displays the following message:

```
Target system device (and boot file if not VMB.EXE):?
```

- 2 Enter the device name of the drive holding the system disk on which you want to rewrite the boot block (use the device naming format described in Section 3.2.1).

For example, suppose the system disk is on an RA81 disk drive that has a controller designation of A and a unit number of 0. Enter the following and press Return:

```
Target system device (and boot file if not VMB.EXE):? DUA0
```

The bootstrap image is most commonly VMB.EXE. If you want to boot using an image other than VMB.EXE, you must specify the full file specification, including device and directory.

- 3 The procedure displays the following message:

```
Enter VBN of boot file code (default is one):
```

Normally the boot code is located at Virtual Block Number (VBN) 1 of the bootstrap image. Press Return to accept the default value of 1.

- 4 The procedure displays the following message:

```
Enter load address of primary bootstrap in HEX (default is 200):
```

The **load address** is the location in memory (specified in hexadecimal notation) to which the system copies VMB.EXE. Normally you copy VMB.EXE to address 200. Press Return to accept the default value of 200.

Writing a New Boot Block on the System Disk

- 5 The Writeboot Utility writes the information you specified to the boot block (block 0) of the system disk.

The Writeboot Utility might display one or more of the following error messages:

You lack LOG_IO privilege

Explanation: This message means you do not have the correct privilege to use the Writeboot Utility.

You lack READ and/or WRITE access to TARGET DEVICE. DISMOUNT and REMOUNT

Explanation: This message means that access to the target device is limited. Check the WRITE PROTECT button on the disk drive.

VCN must be ≥ 1

Explanation: This message means you cannot specify 0 as the virtual block number (VCN).

Glossary

- boot or bootstrap:** The process of loading system software into a VAX computer's main memory. This supplement uses the term *boot* to refer to this process.
- boot name:** A name that helps identify the location of the system disk and the instructions used to boot the system.
- boot server:** A VAX computer that is part of a Local Area VAXcluster or mixed-interconnect VAXcluster. The boot server has a system disk that contains cluster common files; other nodes in the cluster (satellite nodes) can access these files. See also *satellite node*.
- CI-only VAXcluster:** A computer system consisting of a number of VAX computers. It uses only the computer interconnect (CI) to communicate with other VAX computers in the cluster.
- CIBCA:** An interface between the VAXBI bus and the computer interconnect (CI).
- CIXCD:** An interface between the XMI bus and the computer interconnect (CI).
- compact disc:** A read-only disc that can store 600 megabytes (about 600 million characters) of data. Digital supplies software (such as the VMS operating system) and documentation on compact discs.
- computer interconnect (CI):** A type of I/O subsystem that links VAX computers to each other and to HSC devices.
- console mode:** In console mode, the system is halted and the VMS operating system is not running. You control the system using the console subsystem. Console mode is indicated by the console mode prompt (>>>) on the console terminal. See also *program mode*.
- console tape cartridge:** The tape cartridge that contains the console program. It is not shipped as part of the VMS distribution kit. The console tape cartridge is used in the console tape cartridge drive.
- DEBNA:** A VAXBI controller, or adapter, that serves as a port to the Ethernet.
- DEBNI:** A VAXBI controller, or adapter, that serves as a port to the Ethernet.
- DEMNA:** An XMI controller, or adapter, that serves as a port to the Ethernet.
- device name:** The name you use to identify a device on the system. A device name indicates the device code, controller designation, and unit number.
- DWMB:** A 2-module adapter that allows data transfer between the XMI and VAXBI buses.

Glossary

Ethernet: A local communication network (network interconnect) that uses coaxial cable to link multiple computers, information processing devices, and office equipment.

hierarchical storage controller (HSC) device: A self-contained, intelligent, mass storage subsystem that lets computers in a VAXcluster environment share disks. Examples of HSC devices are the HSC50 and the HSC70.

HSC drive: Any drive that is connected to an HSC device. A system disk on an HSC drive can be shared by several computers in a VAXcluster environment.

InfoServer: A server connected to the Ethernet. It is equipped with compact disc drives connected internally and externally to the unit and can be used to install and boot the VMS operating system remotely from a VMS distribution compact disc.

KDB50: An intelligent disk drive controller that supports up to four disk drives on the VAXBI.

KDM70: An intelligent disk drive controller that supports up to eight RA-class disks, or two magnetic tape drives and six RA-class disks on the XMI.

Local Area VAXcluster: Consists of a VAX computer that acts as a boot node and a number of low-end VAX computers that act as satellite nodes. Ethernet connects all of the computers. These computers share a single file system. See also *boot node* and *satellite node*.

local drive: Any drive that is connected directly to a computer.

Mass Storage Control Protocol (MSCP): The protocol used to communicate between a VAX computer and a controller. An MSCP server makes local KDB50 disks accessible to all the nodes in a VAXcluster environment.

media: A generic term that refers to any packaging agent capable of storing computer software. Examples of media are magnetic tapes, compact discs, diskettes, disk packs, and tape cartridges.

mixed-interconnect VAXcluster: A computer system consisting of a number of VAX computers. It uses both the computer interconnect (CI) and the Ethernet to communicate with other VAX computers in the cluster.

network interconnect (NI): A local communication network that uses coaxial cable to link multiple computers, information processing devices, and office equipment. Digital's Ethernet is a network interconnect.

program mode: In program mode, the system is controlled by the VMS operating system. In program mode, you can enter DCL commands, run programs, and receive system messages. See also *console mode*.

remote compact disc drive: A compact disc drive, such as the RRD40, attached to an Ethernet-based server, such as the InfoServer. A remote compact disc drive can be used to install and boot the VMS operating system on VAX computers connected to the same Ethernet as the drive.

RRD40: A compact disc drive.

satellite node: A computer that is part of a Local Area VAXcluster or a mixed-interconnect VAXcluster. A satellite node is booted remotely from the system disk of the boot server in the VAXcluster. See also *boot server*.

save set: The format in which the VMS Backup Utility stores files. The VMS operating system is shipped in this format.

scratch media: Media that are blank or have files that you no longer need. For example, a scratch tape cartridge.

spin up/spin down: To spin up means to bring a disk drive up to operating speed. To spin down means to bring it to a gradual stop.

standalone BACKUP: A version of the VMS Backup Utility that runs from memory without the control of the VMS operating system.

standalone system: A computer system with only one VAX computer.

system disk: The disk that contains (or will contain) the VMS operating system. A VMS system disk is set up so that most of the VMS files can be shared by several computers. In addition, each computer has its own directory on the system disk that contains its page, swap, and dump files.

UNIBUS: A medium-speed I/O subsystem. Some of the devices that can be connected to the UNIBUS are UDA50s, RL02 disk drives, and TU81 magnetic tape drives.

VAXBI: A 32-bit bus.

VAXcluster environment: A computer system consisting of a number of highly integrated VAX computers. There are three types of VAXcluster environments: CI-only, local area, and mixed interconnect.

VAXserver: A VAX computer that functions primarily as the boot server in a Local Area VAXcluster. It also can serve as the batch computer for the cluster. A VAXserver is licensed for only two users.

XMI: A 64-bit, high-speed bus.

Abstract: A study was conducted to determine the effect of a 10% increase in the concentration of a solution on the rate of a chemical reaction. The reaction was carried out at two different temperatures, 25°C and 35°C. The rate of reaction was measured by the time taken for a certain amount of product to be formed. The results showed that the rate of reaction increased with temperature and with the concentration of the solution. The effect of concentration was more pronounced at the higher temperature. The study also showed that the rate of reaction was affected by the surface area of the solid reactant. The larger the surface area, the faster the reaction. The study was carried out in a laboratory setting and the results were compared with theoretical predictions. The study was successful in demonstrating the effect of concentration and temperature on the rate of a chemical reaction. The study also showed that the rate of reaction was affected by the surface area of the solid reactant. The larger the surface area, the faster the reaction. The study was carried out in a laboratory setting and the results were compared with theoretical predictions. The study was successful in demonstrating the effect of concentration and temperature on the rate of a chemical reaction.

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